QR Coding Application Uptake by Individuals with Communication Challenges, Caregivers, and First Responders

Zara G. Lyons

College of Nursing, East Carolina University

Doctor of Nursing Practice

Dr. Courtney Caiola

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Abstract

In emergency situations, individuals with communication challenges and first responders often experience communication barriers. A Quick Response (QR) code mobile application could bridges these barriers and lead to safe, trauma informed care. Individuals upload emergency medical information and contact information to the QR code mobile application. In turn, first responders scan the QR code with mobile devices to access information. A program development project educated first responders and the community regarding the QR code. This Doctor of Nursing Practice (DNP) project sought to increase the use of a QR coding application by first responders and individuals with communication challenges or caregivers. The goal was to assist first responders to meet recommendations for assisting individuals with communication challenges in emergency preparedness. Following the Plan-Do-Study-Act (PDSA) model, this project used a narrated education presentation for first responders, a Beginning of Implementation Survey, an End of Implementation Survey, a community awareness brochure, and reports from a QR code company. Data included education presentation completions, survey completions, Likert style questions and descriptive data from surveys, community organization feedback, and reports from the QR code company. This project addresses recommendations, guidelines and benchmarks set by Healthy People 2020, North Carolina Institute of Medicine [NCIOM] 2030, Centers for Disease Control and Prevention [CDC], Americans with Disabilities Act [ADA], Institute for Healthcare Improvement [IHI], and Federal Emergency Management Agency [FEMA] for assisting individuals with communication challenges in emergencies or natural disasters.

Key words: Communication challenges, disabilities, QR code, first responders, emergency preparedness

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Section I. Introduction

Background

Individuals who have challenges with communication are particularly vulnerable in an emergency, and when they interact with a first responder. The Centers for Disease Control and Prevention [CDC] (2019) explains children with disabilities need more attention regarding emergency preparation, because they experience challenges such as communication barriers, and mobility difficulties (para. 1). During a disaster, individuals who have impaired communication abilities or other medical conditions, are often unable to take life-saving action when they receive an emergency warning (CDC, 2015). One role of the healthcare professional is assisting families in emergency preparedness (CDC, 2019). To achieve this role, healthcare professionals can develop strategies to facilitate communication between individuals with communication challenges and first responders. A Quick Response (QR) coding application is an example of a strategy. A QR code is a visible symbol that can be scanned with a mobile device. After scanning the QR code, the mobile device is directed to specific information encoded by the QR code. In this example, the QR code will provide a link to a mobile application that contains important emergency information for the individual with communication challenges including contact information for the caregiver. See Appendix A for a visual representation of the QR code.

The project partner for this Doctor of Nursing Practice (DNP) project is an Emergency Medical Services (EMS) organization located in the South Central Piedmont of North Carolina. EMS is a first responder community organization.

Organizational Needs Statement

EMS serves all ages and groups within the community. The population with communication challenges served by EMS includes individuals with disabilities, individuals with

hearing deficits, individuals with vision impairment, individuals who do not speak English as a first language and encompasses individuals under the influence of substances, individuals with dementia, and other health challenges. EMS uses translators and caregivers to facilitate communication. EMS also has a program that offers caregivers global positioning system (GPS) bracelets for their loved ones who have a propensity to wander away from home. EMS first responders had mobile devices and a computer when they responded to an emergency call, and these would aid the first responders to access emergency information from the QR code. EMS leadership was motivated to implement QR coding technology to facilitate care for individuals with communication challenges, because when interacting with individuals with communication challenges EMS has challenges communicating efficiently and accurately. EMS has challenges obtaining a complete history when responding to individuals with communication challenges, and this can negatively impact the care they provide. EMS has not used QR code applications to improve communication with patients in the past; although, leadership was familiar with QR codes in other settings.

The QR coding application could promote increased safety for first responders and community members by decreasing the communication barrier. Using the QR code application could help first responders provide appropriate care; and could connect first responders with the individual with communication challenges' caregiver more efficiently. The application cannot change the response time, but the bystander making the 911 call can make the first responder aware of the QR code; thereby, leading to more efficient, effective, and safe care upon responding.

Healthy People 2020 (2020b) reports the following goal for individuals with disabilities: "maximize health, prevent chronic disease, improve social and environmental living conditions,

and promote full community participation, choice, health equity, and quality of life among individuals with disabilities of all ages" (para 1). By providing first responders, caregivers and individuals with communication challenges a strategy to facilitate communication, these at-risk individuals might be provided the opportunity for improved health, more equitable care, access to timely care that prevents a new chronic disease, promotion of full community engagement, options, and improved "quality of life" in the moment and beyond (Healthy People 2020, 2020b, para 1).

Healthy People 2020 (2020a) discusses access to health services and states "access to comprehensive, quality health care services is important for promoting and maintaining health, preventing and managing disease, reducing unnecessary disability and premature death, and achieving health equity for all Americans" (para 2). The QR code application has the potential to address the following aspects of access: equitable access to "health services" from first responders, efficient care, and prevention of harm (Healthy People 2020, 2020a, para 2).

Moreover, Healthy People 2020 (2020c) is focused on improving health communication and technology "to improve population health outcomes and health care quality, and to achieve health equity" (para 1). A goal of the project is to improve communication between individuals with communication challenges and first responders, which might lead to better outcomes, better care, and ultimately more "equitable care" for a population that is at risk of disparate health outcomes and marginalization (Healthy People 2020, 2020c, para 1).

Next, young children and children with disabilities are one group of individuals included in the population of individuals with communication challenges. The North Carolina Institute of Medicine (NCIOM) (2020) spends time addressing goals for improving childhood outcomes; and lists "adverse childhood experiences" as a health indicator focus and "improving child well-

being" as the desired result in the North Carolina 2030 report (p. 19). Children with disabilities or young children in general often cannot communicate fully with first responders, which can lead to an "adverse childhood experience" (NCIOM, 2020, p. 19). The NCIOM (2020) specifically addresses "children with complex health care needs or emotional, behavioral, or developmental issues" as having a higher risk of "adverse childhood experiences" (p. 47). The project might help mitigate the risk of harmful childhood experiences and lead to trauma informed care by promoting positive interaction with first responders. This could contribute to meeting the desired result of "improved child well-being" (NCIOM, 2020, p. 19). The project has the potential to improve "resilience" in children and families who have already experienced adverse events; and resilience promotion is a goal of NCIOM (2020, p. 47).

In addition to Healthy People 2020 and NCIOM 2030 goals, the Triple Aim focuses on:

- Improving the patient experience of care (including quality and satisfaction);
- Improving the health of populations; and
- Reducing the per capita cost of health care (Institute for Healthcare Improvement (IHI), 2020a, para. 1-2).

IHI (2020b) states: "Our goal: Drive the Triple Aim, simultaneously improving the health of the population, enhancing the experience and outcomes of the patient, and reducing per capita cost of care for the benefit of communities" (para 1). When first responders engage with patients with communication challenges in a safe manner, they are taking the first step towards "improving the health" of the population of patients with communication challenges, they promote better patient "experience(s) and outcome(s)," which are components of trauma informed care. Next, they may decrease the cost of care by not leading to additional injuries or

higher levels of care. Additionally, first responders may have the ability to determine the patient's needs more swiftly through the information listed in the application, and by establishing contact with caregivers efficiently.

Problem Statement

Individuals with communication challenges are unable to communicate personal information, or their current need when they encounter first responders in an emergency situation. Additionally, first responders are unable to determine how to best care for an unaccompanied individual with communication challenges. Ultimately safe, therapeutic, trauma informed care is hindered or impossible with a communication barrier between the person needing care and the first responder.

Purpose Statement

The purpose of the DNP project was to increase the uptake of a QR coding application by first responders and individuals with communication challenges and/or their caregivers in order to bridge the communication barrier; and lead to safe, therapeutic, efficient, trauma informed care for individuals with communication challenges.

Section II. Evidence

Literature Review

The DNP Project focused on the encounter between individuals with communication challenges and first responders. This population included first responders, people with disabilities, children, and the geriatric population. The project focused on mitigating harm and increasing safe access to care when an individual with communication challenges encountered first responders. My literature search included researching the population, emergency situations, and interventions. First, I searched Google using the search terms Healthy People 2020, disabilities, and communication, which yielded 81,100,000. I reviewed the first 2 pages of resources, and kept 3 resources from Healthy People 2020 particularly pertaining to disabilities, communication, and access to care. Next, I searched Google using the search terms IHI, Triple Aim, 2020, population, disabilities, and communication. I reviewed the first 2 pages of resources, and kept 1 resource specifically listing IHI, Triple Aim, and population in the title. Then I reviewed the Institute for Healthcare Improvement [IHI] web site for other related articles using the search terms triple aim, population, communication, and technology. I found 1 related article, and kept this article. Next I searched the IHI site for PDSA as a search term and found 198 results. I kept 1 resource from the first result page that was specifically a Plan-Do-Study-Act (PDSA) worksheet resource.

Next, I searched Google for North Carolina Institute of Medicine 2030, population, disabilities, communication, which yielded 14,001 results. I reviewed page 1 of search results, and found the North Carolina Institute of Medicine [NCIOM] 2030 report. I kept this 1 report and reviewed it for information regarding NCIOM goals for the health of individuals with disabilities and communication challenges.

Then I searched Google Scholar for the search terms police, law enforcement, communication, disabilities, and technology. I used the following filters: published within 5 years, and full-text journal article. I obtained 12,300 articles. I reviewed the first 3 pages of results for titles and abstracts for multiple search terms specifically listed and related to the clinical question. Originally, I kept 5 articles from this search. After solidifying my project partner, I narrowed this down to 4 articles still applicable to a project with Emergency Medical Services.

Then I searched Google Scholar with the filters published within 5 years, full-text journal article for the search terms non-communicative, emergency, first responders, communication challenges, technology, QR code, and CDC, which yielded 20 results. I reviewed the titles and abstracts for search terms and topics specific to the project. I kept 2 articles from this search.

Then, I searched the CINHAL database with the following filters: published within 5 years, full text online, journal articles, scholarly and peer review for the search terms emergency medical service communication systems and communication aids for disabled. This yielded one article, and I kept the article.

Then, I started a new search using the following databases: PubMed, Scopus, ProQuest Central, MEDLINE, MEDLINE (Ovid), and CINHAL using the MeSH terms: health services for persons with disabilities and communication aids for disabled. I used the following criteria: published within 5 years, full text online, journal articles, scholarly and peer review. This yielded 313 articles, which I narrowed by reviewing the titles and abstracts for search terms specifically listed, and first responder included. I kept 2 articles.

Next, I performed a search of the databases PubMed, Scopus, ProQuest Central, MEDLINE, MEDLINE (Ovid), and CINHAL and filtered with the same criteria as the last

search: published within 5 years, full text online, journal articles, scholarly and peer review. I used the following MeSH terms for this search: emergency services for non-communicative patient and emergency response, communication barrier, disability, first responders, and safety. This yielded 63 articles, which I reviewed titles and abstracts for search terms specifically included and first responder. I kept 2 articles.

I performed another search of PubMed, Scopus, ProQuest Central, MEDLINE, MEDLINE (Ovid), and CINHAL for the following search terms population health messaging, health, disabilities, emergency management, police, and first responders. I filtered with the following criteria: published within 5 years, full text online, journal articles, scholarly and peer review, which yielded 35 articles. I reviewed titles and abstracts for specific search terms included and related to the project. I kept 4 articles.

The next search of PubMed, Scopus, ProQuest Central, MEDLINE, MEDLINE (Ovid), and CINHAL included the search terms persons with disabilities, communication difficulty, police, first responder, and health emergency. I filtered with the following criteria: published within 5 years, full text online, journal articles, scholarly and peer review, which yielded 69 articles. I reviewed titles and abstracts for specific search terms included and related to the project. I kept 3 articles.

Then, I used the Google search engine to research first responder guidelines and training for caring for individuals with communication challenges and individuals with disabilities. I found 310,000 results. I filtered by published in 5 years which narrowed the search results to 12,000. I reviewed the first 5 pages of results for reputable organizations with titles specific to first responder guidelines and training related to caring for individuals with communication challenges and disabilities. I then selected 6 resources from the Centers for Disease Control &

Prevention [CDC], Federal Emergency Management Agency [FEMA], National Council on Disability, and the U. S. Department of Health and Human Services [USDHHS] regarding expectations of first responders in emergencies and some training resources.

Next, I performed a Google search for information on the project site community including a Community Needs Assessment. This yielded 186,000 results. I selected the first result, because it was clearly the Community Needs Assessment for the project site county. I also performed another Google search to determine statistical background data regarding the population of individuals with disabilities in the project site county. I searched using the terms [redacted] County disability statistics, which yielded 120,098 results. I kept 3 resources listed on the first 2 pages of results that included census and governmental data regarding individuals with disabilities specific to the project site county and state.

I searched PubMed, Scopus, ProQuest Central, MEDLINE, MEDLINE (Ovid), and CINHAL for a validated survey and specifically searched for the authors: Weiner, Lewis, Stanick, Powell, Dorsey, Clary, Boynton, and Halko after a suggestion from my project coach. I selected 2 resources that included the Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) survey.

I was searching for the highest level of evidence available, but kept a variety of articles due to a gap in the research regarding interventions related to reducing the communication barrier between individuals with communication challenges and first responders.

After reviewing all the literature, Melnyk et al.'s, (2016) Rating System for the Hierarchy of Evidence to Guide Clinical Interventions was used to evaluate the literature. For level VII resources including guidelines, opinions, and recommendations: twenty-one resources were kept. Next, nine level VI studies were kept including single descriptive or qualitative studies. Then,

four level V studies were found including systematic reviews of descriptive or qualitative studies. For level IV a case control or cohort study, one article was kept. See Appendix B for the Literature Matrix.

Current State of Knowledge

Individuals with communication challenges are particularly vulnerable in an emergency. Due to communication challenges and mobility difficulties people with disabilities, children, and the geriatric population experience challenges responding in an emergency and accessing the care they need (Centers for Disease Control and Prevention [CDC], 2019; CDC, 2015; Constantou et al., 2017; Copenhaver & Tewksbury, 2019; Eide et al., 2018; Fifolt et al., 2016; Kim & Zakour, 2017; Koeffler et al., 2019; Kreisberg et al., 2016; Peek & Stough, 2010; Smith & Notaro, 2015; Wyte-Lake et al., 2018; Zwaigenbaum et al., 2016) Furthermore, these individuals experience less equitable care, and have more disparate outcomes (Agoratus, 2019; Healthy People 2020, 2020 a; Healthy People 2020, 2020 b; Kim & Zakour, 2017; Kreisberg et al., 2016; North Carolina Institute of Medicine [NCIOM], 2020; Neave-DiToro et al., 2019; Peek & Stough, 2010; Smith & Notaro, 2015; Wolf-Fordham, 2014; Wyte-Lake et al., 2018; Zwaigenbaum et al., 2016).

The literature also focused greatly on emergency and disaster preparedness; and advised health professionals must educate families on making a plan for their family especially for individuals with special medical needs (CDC, 2019; CDC, 2015; Fifolt et al., 2016; Kim & Zakour, 2017; Kreisberg et al., 2016; Peek & Stough, 2010; Wyte-Lake et al., 2018). Pre-planning for emergencies is the responsibility of emergency and governmental agencies, as well as individuals with special needs (National Council on Disability, 2014). Individuals with special needs should be taught how to make an effective, personalized emergency plan, so they can

rapidly communicate necessary information to first responders (National Council on Disability, 2014).

The USDHHS (2019a) and USDHHS (2019b) advises first responders must prioritize individuals with disabilities during emergencies and disasters; and take special care in meeting their needs due to "functional limitations" (2019b, para. 2-4) and difficulty accessing care. In addition, the Americans with Disabilities Act must continue to be followed in emergencies; and special communication needs must be addressed (FEMA, 2002; National Council on Disability, 2014; USDHHS, 2019b).

Current Approaches to Solving Population Problem(s)

As discussed above, much of the literature recommended pre-planning for emergencies and disasters; and the onus of this responsibility is on first responder and governmental agencies as well as on individuals with special needs (CDC, 2019; CDC, 2015; Fifolt et al., 2016; Kim & Zakour, 2017; Kreisberg et al., 2016; National Council on Disability, 2014; Peek & Stough, 2010; Wyte-Lake et al., 2018). Additionally, first responder agencies have focused on sensitivity and awareness training when encountering individuals with special needs (Copenhaver & Tewksbury, 2019; Eadens et al., 2015; Engelman & Deardorff, 2016; Kelly & Hassett-Walker, 2016; Kreisberg et al., 2016; National Council on Disability, 2014; Neave-DiToro et al., 2019; Wolf-Fordham et al., 2014). Next, the government recommends communication regarding emergencies and disasters must be presented in multiple formats to reach individuals with communication challenges; and local agencies are encouraged to communicate in ways individuals in their communities can understand (CDC, 2015; National Council on Disability, 2014; USDHHS, 2019b). For example, communication formats could include, audio, print, large print, electronic, in-person.

There is a gap in the literature regarding specific methods for first responders to facilitate communication with individuals with communication challenges and vice versa despite the recommendation to improve communication. This project focused on addressing this gap by piloting a QR code application caregivers could update with emergency contact information, and any other relevant information. I encouraged a first responder agency to use the QR code application when they responded to a call for an individual with communication challenges individual. I publicized the use of the QR code application to caregivers of individuals with communication challenges.

Evidence to Support the Intervention

The evidence suggested health care professionals must educate individuals with special needs how to prepare in an emergency or disaster (CDC, 2019; CDC, 2015; Fifolt et al., 2016; Kim & Zakour, 2017; Kreisberg et al., 2016; National Council on Disability, 2014; Peek & Stough, 2010; Wyte-Lake et al., 2018). The QR code application intervention is a tool health care professionals can teach caregivers and individuals with communication challenges to use in order to prepare for their interaction with first responders in an emergency. Additionally, the literature advised first responders need to take responsibility for learning how to communicate with individuals in an emergency (CDC, 2015; National Council on Disability, 2014; USDHHS, 2019b). The QR code application provided a tool for first responders to meet the responsibility of learning how to communicate with individuals with communication challenges and individuals with disabilities. Ultimately, the overarching theme in the literature was pre-planning for an emergency or disaster, and the QR code application has the potential to meets this goal (CDC, 2015; FEMA, 2002; National Council on Disability, 2014; USDHHS, 2019b).

Evidence-Based Practice Framework

Identification of the Framework

I used the Plan-Do-Study [PDSA] model to implement the DNP project (Institute for Healthcare Improvement [IHI], 2016). The PDSA model was well suited to a program development project, because implementation could be adapted easily over the course of the project. Projects completed with the PDSA model go through several PDSA cycles, which involves adapting interventions after evaluating the previous cycle (IHI, 2016).

The PDSA model involves thorough planning prior to implementation and prior to beginning each new cycle (IHI, 2016). Planning is crucial to any project, but especially necessary for a new program. The Do stage involves action, which is necessary to getting a new project adapted in order to promote successful forward momentum during the next cycle (IHI, 2016). The final stage of the cycle Act involves taking action based on evaluation of the cycle (IHI, 2016). Continued forward progress is achieved by starting the next cycle and repeating the above stages (IHI, 2016). Then forward progress is encouraged repeatedly by continuing additional PDSA cycles (IHI, 2016). Any new program will need continual tweaks. These tweaks should be based on study of what worked and what did not work in a previous cycle. Change should not be made in a project randomly. It should be guided by study (IHI, 2016).

During the Plan stage, I investigated what technology first responders used during an emergency such as a smart phone, and what attitudes they had regarding using this type of technology when interacting with individuals with communication challenges. I investigated the EMS organization's attitudes toward using a QR code application as a strategy to improve communication with individuals with communication challenges. The planning stage included developing a narrated education presentation for first responders and a Beginning of

Implementation Survey. See Appendix C for the survey. The planning stage included inquiry into whether caregivers wanted to provide emergency information using a QR code application. During the planning stage of this project, I considered how well matched the intervention was to the values of the organization, the ability of the organization to support change and factors that affected the first responder organization in implementing the QR coding application intervention.

For the Do stage, the narrated education presentation was shared with first responders via their education portal. The Beginning of Implementation Survey was uploaded to the education portal. Additionally, a Community Awareness Brochure for the community was developed to educate the community about the QR code application as a strategy to improve communication between individuals with communication challenges and first responders.

For the Study stage, data was collected on narrated education presentation completion, survey completion, and descriptive data from the survey. Additionally, feedback was solicited from first responders and the Assistant Director of EMS. To evaluate this project, I considered survey responses and the amount of participation from first responders. Finally, the Act stage involved planning the next cycle based on evaluation of the first cycle.

Ethical Consideration & Protection of Human Subjects

Individuals with communication challenges who cannot advocate for themselves including individuals with disabilities, people with mental health disorders, children, and the elderly composed the patient population for this project. The ethical principle, respect for persons was a consideration for this population (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). Some of these individuals could make autonomous decisions to participate in the project; however, others did have the capacity to make an autonomous decision. In this case, the caregiver was asked to be the representative to

consent for an individual unable to make an autonomous decision. The project aimed to protect and provide benefit to this population who deserves special protection due to diminished autonomy (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). The project involved providing information about the QR code application to the population of individuals with communication challenges and their caregivers. There was no requirement to subscribe to the application. If the population felt the QR code application would be helpful to them, they could choose to subscribe at their discretion.

Next, the principle of beneficence, was an important consideration for this population (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). The population of individuals with communication challenges needs to be protected from harm; and the goal of the project was to reduce harm for this population by bridging the communication barrier; and leading to safe, therapeutic, trauma informed, efficient care for individuals with communication challenges.

Additionally, the principle of justice, was another ethical goal for this project (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). The project sought to increase access to equitable care for a patient population who is often at risk of disparate outcomes due to a communication barrier between first responders and individual with communication challenges (FEMA, 2002; National Council on Disability, 2014; USDHHS, 2019a; USDHHS, 2019b).

Private personal and health information was captured in the QR code mobile application. To address this ethical consideration, the caregiver and/or individual with communication challenges made the decision about what information to include. The information was not controlled by a healthcare professional, health system, first responder, first responder

organization, or this project leader. However, the information could be accessed by unintended individuals, if they scanned the QR code. The caregiver/individual was encouraged to carefully consider what information they opted to share in the mobile application, in order to best protect the privacy and safety of the individual with communication challenges. Additionally, all participant data was encrypted by the QR code mobile application company.

The next consideration was if the intervention was equal and equitable to everyone in the target population and whether the elderly were able to use the technology of a mobile application as easily. The caregiver was encouraged to use the technology safely and appropriately; and to seek assistance if they did not understand how to use the technology in a safe and appropriate manner. The community awareness brochure provided education that described appropriate use for the QR code mobile application and provided links to the QR code company website and contact information to learn more in depth information before choosing to subscribe to the application. The potential of harm to the target population was also considered. If the caregiver did not update the information regularly, the first responder could provide care without the appropriate or accurate information. For example, if a new allergy or medical condition was not included, the first responder could provide care unsafely. During the project, caregivers were educated regarding the importance of updating information regularly. The potential of whether anyone in the target population could be taken advantage of during the project implementation was considered. If the information was obtained by someone with ill intent, the patient could suffer harm. A predator could potentially use the information to gain the patient's trust. To address this concern, caregivers were advised to carefully weigh providing enough information for a first responder to provide safe care, while protecting individuals with communication challenges from a predator. The information was and is ultimately controlled by the caregiver

and/or individual with a communication challenge; they can choose to share as much or as little information that they deem appropriate and safe. A QR code is more secure than a printed paper carried in a wallet or other less hidden form of information. A predator can easily use a printed paper and the included information to harm an individual; however, a predator is not likely to correlate the QR code wearable as a source of information, or have means to access the information. Another concern involved the mobile application being hacked or mined by advertising or other entities. The mobile application company has safeguards in place to protect against these concerns. Also, if the mobile application goes down, the first responder will not be able to access the emergency information. The caregiver was encouraged to have an alternate emergency plan.

The ethical principle, respect for persons was a consideration for first responders as well (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). First responders had the autonomy to decide whether to participate in the project. Next, the principle of beneficence, was an important consideration for first responders (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). First responders should be protected from harm; and should not suffer any repercussions for choosing to participate or not to participate. As employees of the project site organization, they should not suffer any concerns for loss of employment or organizational benefits.

Given these ethical considerations, I completed the Social/ Behavioral Research Investigators and Key Personnel course through Collaborative Institutional Training Initiative (CITI program). I used the knowledge gained to promote and protect the ethical treatment for all participants in the project. My project site was approved through the chain of command at EMS.

The project was also reviewed through the East Carolina University IRB process and deemed as Quality Improvement/Program Development.

Section III. Project Design

Project Site and Population

The project site was a first responder organization in the South Central Piedmont of North Carolina. The population was individuals with communication challenges and/or their caregivers and first responders. Facilitators for the project included an invested EMS Assistant Director who acted as the site champion, and a project partner organization that serves the population and experiences challenges related to communication barriers. The project provided a solution to this challenge and was a facilitator. The first responders carried smart phones already and used them for their work duties; and this was a needed device for the project.

Barriers included the COVID-19 pandemic and civil unrest related to recent social justice concerns in the community, which made site approval challenging. Additionally, the site had much energy and person hours focused on the pandemic as well as the emergency response to social justice concerns. This made focusing on a new project challenging. Additionally, first responders might have experienced burnout related to the nature of their work in which almost every aspect was affected by the recent challenges of the pandemic and social justice concerns in the community.

Description of the Setting

The project site was a local EMS organization in the South Central Piedmont of North Carolina. The EMS organization was located in a partially suburban and partially rural area. The county had experienced significant growth, but most significantly near borders with larger surrounding cities (Nousaine et al., 2016). From 2000 to 2016, the county increased in size from a population just over 130,000 to almost 200,000 residents (Nousaine et al., 2016). The largest age group was comprised of eighteen to sixty-four-year olds, and this group made up 61.2% of

the population (Nousaine et al., 2016). The next largest age group included six to eighteen-year olds at 19.9% (Nousaine et al., 2016). Females made up 51.2% of the populations and males made up 48.8% (Nousaine et al., 2016). Whites made up the majority of the population at 68.1%, and the next largest group was African Americans at 17.6% (Nousaine et al., 2016). The Hispanic population made up 10.1% and Asians 3.1% (Nousaine et al., 2016).

Housing, substandard housing, and homelessness were identified by community informants as issues needing to be addressed (Nousaine et al., 2016). For maternal and child health indicators, 10.2% of mothers smoked during pregnancy (Nousaine et al., 2016). Smoking during pregnancy may potentially lead to disabilities and health challenges within the community. Education levels for residents included: high school graduates or higher made up 88.3%, and bachelor's degree or higher made up 27.2% of residents (US Census Quick Facts-2015 Population Estimates for the county as cited in Nousaine et al., 2016, p. 18). Regarding income, 21.1 % of residents, the largest group was made of residents with an income of less than $10,000 per year (Nousaine et al., 2016). A financial barrier could have existed in the community regarding uptake of the QR code application. Regarding technology access, 93% of households had a computer, and 88% had broadband internet (United States Census Bureau, 2019). With the majority of households having computer and internet access, this could have been a facilitator to uptake of the QR code application in the community. Eighty-three percent of residents had medical insurance, and seventeen percent were uninsured (Nousaine et al., 2016). Access or lack of access to insurance could affect how often community members sought care from EMS. The violent crime rate in this community was much lower compared to North Carolina and the United States overall (Nousaine et al., 2016). This could have contributed to

more or less interaction between individuals with communication challenges and first responders.

Description of the Population

First Responders were participants in the project, because they listened to a narrated education presentation, completed surveys for descriptive data, and it was planned they would use the QR code application when they responded to emergency calls. Feedback for improvement of the new program during development and implementation was solicited from first responders.

The population served by the project intervention was composed of caregivers and individuals with communication challenges who could not advocate for themselves including individuals with disabilities, individuals with mental health disorders, children, and the elderly. Seven percent of the population age sixty-five years had a disability (United States Census Bureau, 2019). For the overall population, 10.5% of residents had a disability (Institute on Disability, 2018). In 2018, there were 1,804 psychiatric emergency department admissions ([redacted] Health Alliance, 2018). The population of individuals with communication challenges was diverse and EMS served all members of the community, so at any time in their daily clinical practice first responders could encounter this population.

Project Team

The team included a project team leader, a faculty project advisor/coach, a site champion, and the Specialty Services Director. The project team leader was a DNP student at East Carolina University. The project team leader met with the project site to obtain initial project site approval, developed the narrated education presentation, developed the Beginning and End of Implementation surveys, developed the Community Awareness Brochure, guided

implementation, communicated regularly with all other members of the team, provided project status updates, tracked data, and evaluated data related to the project. The faculty project advisor/coach, a faculty member in the East Carolina University College of Nursing, met with the project team leader bi-weekly and as needed; assisted with initial project site approval through the East Carolina University IRB process; and provided regular guidance regarding planning, implementation, and evaluation of the project. The site champion was the Assistant Director of EMS; he provided initial project site approval through the EMS chain of command; assisted with implementation, planning, and reviewed project updates from the project team leader. The EMS Specialty Services Director facilitated uploading the narrated education presentation and surveys to the EMS employee education portal; and forwarded regular communication to EMS participants from the project team leader.

Project Goals and Outcome Measures

Purpose Statement

The purpose of the DNP project was to increase the uptake of a QR coding application by first responders and individuals with communication challenges and/or their caregivers in order to bridge the communication barrier; and lead to safe, therapeutic, trauma informed, efficient care for individuals with communication challenges.

The project went through an approval process at EMS through the chain of command. The project was approved by the Assistant Director and then the Director of EMS. The project was approved through the ECU IRB as a program development, process improvement project.

The primary goals of the project were:

1. Increase the uptake of the QR code intervention by individuals with communication challenges and/or their caregivers during implementation.

Outcome Measures: Raise Community Awareness and use of the QR code application as evidenced by the number of QR code application sign-ups and number of times the QR codes were used as determined by reports from the QR code company.

2. Raise first responder awareness of the QR code intervention during implementation.

Outcome Measures: This was determined by the number of narrated education presentation completions by first responders.

3. Increase first responder recognition and use of QR code when interacting with individuals with communication challenges.

Outcome Measures: This was determined by the number of narrated education presentation completions by first responders and by survey response questions specifically asking if individuals had been encountered who had a QR code. Additionally, the reports from the QR code company provided data regarding when a QR code was accessed.

4. Describe the experience of first responders when interacting with individuals with communication challenges.

Outcome Measures: This was determined from descriptive data extracted from Beginning of Implementation and End of Implementation Surveys.

5. Describe the experience of first responders using the QR code application when interacting with individuals with communication challenges.

Outcome Measures: This was determined from descriptive data extracted from Beginning of Implementation and End of Implementation Surveys.

Description of the Methods and Measurement

The Plan-Do-Study-Act [PDSA] model was used to conduct the project and was adapted over the course of the project. Initially, the first responders were asked to review a narrated

education presentation through the EMS employee education portal. The community was educated about the QR code intervention through distribution of a Community Awareness Brochure to community members by Community Paramedics, and through Community Organizations serving individuals with disabilities and communication challenges. I communicated with Community Organizations and the Local County school board via email regarding the Community Awareness brochure.

I gathered data on the number of narrated education presentations completions and the rate of completion. I gathered data on the number of Beginning of Implementation and End of Implementation Survey completions. Data was gathered regarding the acceptability and feasibility of using a QR code for emergency information from first responder participants. I gathered data regarding the experience of first responder interactions with individuals with communication challenges in the field. I gathered descriptive data regarding first responders participating in the survey. See Appendix C for the survey using questions from Weiner et al. (2017). Open-ended questions were asked in addition to the Likert scale style survey developed by Weiner et al. (2017).

Additionally, data regarding uptake was collected from the QR code company every seven to ten days. The QR code company reports provided the number of individuals signing up to use the QR code, and how often the QR code was accessed. A coupon code to track participants specific to this project was created by the QR code company to differentiate this pilot project from other students who were implementing related projects in other areas of the state. Additionally, the coupon code helped distinguish participants related to this project from individuals who could already be using QR code technology prior to implementation of this project.

Discussion of the Data Collection Process

Data was collected from an electronic survey uploaded to the first responders' education portal at the beginning of implementation and was emailed to them at the end of implementation. See Appendix C for the surveys. The QR code company ran reports every seven to ten days and provided the reports and data to the project team leader. I also received qualitative feedback from an organization serving individuals with disabilities. This provided an insider perspective on acceptability of an intervention with the population of individuals with disabilities.

Implementation Plan

The PDSA method was used for implementation (IHI, 2016). The cycle was revised monthly during implementation. Revisions were based on survey data, input from the site champion and Specialty Services Director, and input from my faculty project advisor. The cycle was also revised based on data obtained from the QR code company regarding uptake of the QR code intervention by individuals with communication challenges.

Timeline

I met with the EMS Assistant Director serving as the site champion in early August 2020, and achieved final site approval. I emailed the narrated education presentation and project justification to the site champion. Implementation started with uploading the narrated education presentation and the beginning of implementation survey to the first responder education portal. I met with the faculty project advisor on a biweekly basis. Frequent emails occurred with the site champion and Specialty Services Director. I planned to attend first responder role call monthly to remind first responders about the project and obtain feedback. However, this was not an option due to the pandemic. Instead, I recorded frequent audio messages that were emailed to the team with project updates. In these audio updates I lead included email contact and requested feedback

from the team by email or on the surveys. Data was collected from the QR code company every seven to ten days. Meetings occurred on an as needed basis with other students implementing related projects in other areas of the state and the lead DNP project program faculty member. See Appendix D for visual representation of the timeline.

Section IV. Results and Findings

Results

Outcomes Data

The results and findings were compared to project goals and outcomes measures.

1. Increase the uptake of the QR code intervention by individuals with communication challenges and/or their caregivers during implementation.

Outcome Measures: Raise Community Awareness and use of the QR code application as evidenced by the number of QR code application sign-ups and number of times the QR codes were used as determined by reports from the QR code company.

I predicted 5 community members would sign-up for the QR code application, and data was collected from the QR code company. From this data, there were not any QR code sign ups or instances of QR codes being accessed associated with this project. Due to this, goal 1 was not met.

2. Raise first responder awareness of the QR code intervention during implementation.

Outcome Measures: This was determined by the number of narrated education presentation completions by first responders.

I expected 25-50% narrated education presentation completion. The narrated education presentation completion rate was thirty one percent of the first responders for a total of 46 out of 150 participants. This met goal 2, reflecting awareness of the QR code.

I predicted a 25-50% survey completion rate for both the Beginning of implementation and End of implementation surveys. The Beginning of Implementation Survey completion rate was 18% of EMS first responders for 27 out of approximately 150 participants. The End of Implementation Survey completion rate was 8% of the EMS first responders for 12 out of

approximately 150 participants. This did not meet the goal for survey completion rate, reflecting goal 2 awareness of the QR code.

3. Increase first responder recognition and use of QR code when interacting with individuals with communication challenges.

Outcome Measures: This was determined by the number of narrated education presentation completions by first responders. This was determined by survey response questions specifically asking if individuals had been encountered who had a QR code. Additionally, the reports from the QR code company provided data regarding when a QR code was accessed.

I predicted 5 community members would sign up for the QR code application, and EMS first responders might encounter individuals who had signed up for the QR code application during the course of the project. It was anticipated it would take time for full uptake by community members. The narrated education presentation completion rate of 30.7% as discussed above reflects goal 3, first responder recognition of the QR code. However, goal 3 was not met by Beginning of Implementation and End of Implementation survey answers regarding encountering an individual wearing a QR code. Additionally, reports from the QR code company indicated no community sign-ups or instances of QR codes being accessed associated with this project. As a result, these findings did not meet goal 3.

4. Describe the experience of first responders when interacting with individuals with communication challenges.

Outcome Measures: This was determined from descriptive data extracted from Beginning of Implementation and End of Implementation Surveys.

First responders provided data by participating in the Beginning and End of Implementation Surveys regarding their experiences with individuals with communication challenges, reflecting goal 4. See descriptive data in tables below.

Table 1

Survey Question 14

Estimate how many times you interact with a non-communicative/communication challenged individual in the average month during the course of your work duties?				
	Beginning of Implementation		End of Implementation	
Answer	Percent	Number of Responses	Percent	Number of Responses
Never	18.52%	5	16.67%	2
1 time per month	44.44%	12	66.67%	8
2-4 times per month	33.33%	9	16.67%	2
5-9 times per month	3.70%	1	0.00%	0
10+ times per month	0.00%	0	0.00%	0
Total	100%	27	100%	12

Most of the below survey questions were open-ended; therefore, participant responses often included multiple categories. As a result, the numbers do not add to the total number of responses.

Table 2

Survey Question 15

Describe the demographics of noncommunicative/communication challenged individuals you encounter during the course of your work duties i.e. (gender, age, race, reason, or diagnosis for communication challenge)?		
Demographics of Individuals with communication challenges	Beginning of Implementation Survey	End of Implementation Survey
Number of Responses	13 out of 27	6 out of 12
Deaf or Hard of Hearing	5	0
Alzheimer's or Dementia	3	0
Autism	2	1
Developmental Issues	0	1
Language Barrier or English as a Second Language	0	2
Underserved Populations	0	1
Geriatric or Elderly	3	2
Male	3	2
Female	1	2
African American or Black	1	2
Caucasian or White	3	2
Random	1	0
Unknown or Don't Know	2	0

Table 3

Survey Question 16

Describe the challenges you have when responding to a non-communicative/communication challenged individual while carrying out your work duties?	Combined Beginning and End of Project Surveys
Number of Responses	20
Communication Explicitly Answered	6
Distractions/Noise	2
Difficulty Without Available Translator, Bystander, Family Member	2
Difficulty Obtaining Medical History	5
Difficulty Obtaining Medications	1
Difficulty Obtaining Demographics	1
Difficulty Obtaining Chief Complaint	4
Difficulty Assessing Pain	1
Difficulty Providing Care	1
Difficulty Explaining Needed Diagnostics	1
Not a Challenge if Non-Emergent Call	1

Table 4

Survey Question 17

How do you typically obtain emergency information from a non-communicative/communication challenged individual?	Combined Beginning and End of Project Surveys
Number of Responses	25
Family Member	16
Caregiver	7
Friend	2
Healthcare Professional	3
Bystander	2
Directly with Patient	1
Writing or Typing	6
Paperwork	1
Google Translate	1
Medical Alert	1
Talk Louder or Slower	1

5. Describe the experience of first responders using the QR code application when interacting with individuals with communication challenges.

Outcome Measures: This was determined from descriptive data extracted from Beginning of Implementation and End of Implementation Surveys.

From both surveys and the QR code company reports, there were not any QR code sign-ups or instances of a QR code being accessed associated with this project. As a result, goal 5 was not met. However, when asked a series of 8 Likert style questions, the first responders generally viewed the intervention favorably. This reflected first responder participant attitudes towards the intervention, which met goal 5. See data below for more details on the Likert style question data.

Table 5

Survey Question 1

Using a mobile device to access a QR Code for non-communicative individuals seems fitting.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	14.81%	4	58.33%	7
Agree	51.85%	14	41.67%	5
Neither agree nor disagree	25.93%	7	0.00%	0
Disagree	7.41%	2	0.00%	0
Completely Disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 6

Survey Question 2

Using a mobile device to access a QR Code for non-communicative individuals seems suitable.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	18.52%	5	58.33%	7
Agree	51.85%	14	41.67%	5
Neither agree nor disagree	29.63%	8	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely Disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 7

Survey Question 3

Using a mobile device to access a QR Code for non-communicative individuals seems applicable				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	14.81%	4	58.33%	7
Agree	66.67%	18	41.67%	5
Neither agree nor disagree	18.52%	5	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 8

Survey Question 4

Using a mobile device to access a QR Code for non-communicative individuals seems like a good match.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	14.81%	3	50.00%	6
Agree	66.67%	18	50.00%	6
Neither agree nor disagree	18.52%	6	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 9

Survey Question 5

Using a mobile device to access a QR Code for non-communicative individuals seems implementable.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	11.11%	3	41.67%	5
Agree	70.37%	19	58.33%	7
Neither agree nor disagree	18.52%	5	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 10

Survey Question 6

Using a mobile device to access a QR Code for non-communicative individuals seems possible.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	18.52%	5	41.67%	5
Agree	66.67%	18	58.33%	7
Neither agree nor disagree	14.81%	4	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 11

Survey Question 7

Using a mobile device to access a QR Code for non-communicative individuals seems doable.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	18.52%	5	41.67%	5
Agree	62.96%	17	58.33%	7
Neither agree nor disagree	18.52%	5	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

Table 12

Survey Question 8

Using a mobile device to access a QR Code for non-communicative individuals seems easy to use.				
	Beginning of Implementation Survey		End of Implementation Survey	
Answer	Percent	Number of Responses	Percent	Number of Responses
Completely agree	14.81%	4	33.33%	4
Agree	62.96%	17	66.67%	8
Neither agree nor disagree	22.22%	6	0.00%	0
Disagree	0.00%	0	0.00%	0
Completely disagree	0.00%	0	0.00%	0
Total	100%	27	100%	12

See Appendix C for the surveys in entirety.

Process Measures

I completed 4 PDSA cycles. I collaborated with the site champion and the Specialty Services Director to distribute the narrated education presentation, the Beginning of Implementation and End of Implementation Surveys. I also collaborated with the site champion to distribute the Community Awareness Brochure to Community Paramedics who shared the brochure with community members who had communication challenges. I used narrated education presentation completion rates collected through the EMS education portal. Survey completion rates were used to assess the site's level of awareness about the intervention. For the first PDSA cycle, I predicted 25-50% of EMS first responders would watch the narrated education presentation and complete the Beginning of Implementation Survey by the middle of September 2020. By 9/13/20 21 surveys were completed. Per the Assistant Director there were

approximately 150 EMS first responders. The Beginning of Implementation Survey completion rate was 14%. I used Qualtrics reports to determine survey completion rates and other data from the surveys. After running a Qualtrics report, the majority of participants completing the survey answered with a favorable attitude towards the QR code intervention as displayed in outcomes data above.

During the first PDSA cycle, I predicted awareness would be raised in the community. I predicted, it would take time to observe sign ups and the QR code being accessed. I predicted 10 community members would sign up for the QR code service during this cycle. I obtained data from the QR code application company regarding sign-ups and times QR codes were accessed. There were not any community sign-ups during the first cycle.

During the second PDSA cycle, I sent an email with recorded audio to the Specialty Services Director and site champion; and this message was distributed to first responder participants to encourage narrated education presentation and Beginning of Implementation Survey participation. I predicted another 15-25% of EMS participants would watch the narrated education presentation and complete the Beginning of Implementation Survey by the end of the second cycle. There was a 30.7% total completion rate with 15 additional EMS first responders who completed the narrated education presentation. This was a 10% increase in the completion rate from the previous PDSA cycle. For the Beginning of Implementation Survey the overall completion rate was 18% with 6 additional EMS first responders who completed the survey. This was a 4% increase in the Beginning of Implementation Survey completion rate from the first PDSA cycle.

After running a Qualtrics report, the majority of participants completing the Beginning of Implementation Survey still answered with a favorable attitude towards the QR code intervention. See the outcomes data section for specific data for each Likert style question. One additional participant reported interacting with individuals with communication challenges outside of their first responder work duties for a total of 3 participants. Two of those that reported this experience, interacted with the individual in another work setting.

During the second PDSA cycle, I edited the Community Awareness Brochure as advised by faculty. Community Paramedics received the brochure for community awareness towards the end of the second cycle. I predicted awareness would be raised in the community, and 5 community members would sign up for the QR code application by the end of October 2020. More time and work were needed to raise community awareness. There were not any community member sign-ups as reported by the QR code application company during this cycle.

For the third PDSA cycle, the Beginning of Implementation Survey was suspended to give EMS a break from the survey prior to completing the End of Implementation Survey starting several weeks later. To conclude the Beginning of Implementation Survey, the Specialty Services Director closed both the survey and narrated education presentation on the employee education portal. I started planning stages and adaptations for the fourth and final PDSA cycle. I completed additional research regarding improving survey completion rates. From this research, individuals tend to complete surveys in the first 2 weeks, the promise of incentives encourages participation, and frequent reminders encourage increased participation (Phillips, et al., 2016; Hamilton 2003; SurveyMonkey 2011; Experian 2012; Mailchimp 2014). When the Beginning of Implementation Survey was suspended, I sent an audio email to EMS participants that was

forwarded to them by the Specialty Services Director. In this email, I provided a status update on the project, advised the Beginning of Implementation Survey had been closed, made them aware the End of Implementation Survey would open in a few weeks, expressed appreciation for their participation, and stated my goal of 25-50% End of Implementation Survey completion rate. I also emailed the Specialty Services Director and site champion to investigate the logistics of providing an incentive to EMS participants prior to distributing the End of Implementation Survey. I never received input regarding how I could provide an incentive/token of appreciation to EMS first responders.

Regarding community awareness, I made efforts to raise community awareness about the project during the third PDSA cycle. I predicted awareness would be raised in the community, and 5 community members would sign up for the QR code application by the end of the project dated. I reached out to EMS to contact the Community Paramedics by emailing a short audio message for the Community Paramedics. By the end of the third PDSA cycle, I was awaiting a response regarding the Community Paramedics' progress.

During the Do stage, I changed plans after consulting with my faculty advisor regarding feasibility and cost. I researched and emailed three local community organizations and the county School Board to raise community awareness. I was waiting for responses from the organizations at the end of the third PDSA cycle. By the end of the third cycle, there were not any community sign-ups for the QR code application based on reports from the QR code application company.

For the fourth and final PDSA cycle, the End of Implementation Survey was distributed as planned. I predicted 25-50% of EMS first responders would complete the End of

Implementation Survey by the end of the project. I sent multiple audio reminder emails to the site champion and Specialty Services Director to forward to EMS first responders during the final cycle. I again expressed appreciation to EMS first responders for their participation in the project, and expressed empathy for the challenges and time constraints they were experiencing during the pandemic. The End of Implementation Survey link was embedded in a PowerPoint with an audio recording, since the employee education portal option was closed. During the first week of the survey period, 8 participants completed End of Implementation survey, which was 5 % of participants. The participants still viewed the intervention favorably in the End of Implementation Survey. See the tables in the outcomes data section for specific data.

I ran a Qualtrics report to track completion and responses during the fourth PDSA cycle, and 4 additional participants completed the End of Implementation Survey. This was a 3% increase in completion for a total End of Implementation Survey completion rate of 8%. This did not meet the predicted goal of 25-50% survey completion.

For community awareness as discussed above, I predicted awareness would be raised in the community, and 5 community members would sign up for the QR code application by the end of the project. One community organization agreed to email the Community Awareness Brochure to their group. I met with a second community organization virtually, and they agreed to share the brochure with individuals requesting a related resource. I did not hear back from the county school board. From reports provided by the QR code application company, there were not any QR code application sign-ups or instances of QR codes being accessed related to this project. As a result, this goal was not met.

Discussion of Major Findings

The project findings will be discussed below in relation to how this project has the potential to impact the community and future study. It would have been helpful to start community awareness efforts at the beginning of the project, because this could have provided more time to educate the community and achieve community buy-in. Earlier efforts could have led to community member sign-ups for the QR code mobile application, a tool with the potential to bridge communication barriers between individuals with communication challenges and first responders.

This project raised awareness in first responders regarding their role in working with individuals with communication disorders as evidenced by narrated education presentation completion. From the literature review, healthcare professionals such as first responders and nurses must be aware of the vulnerability of individuals with communication challenges in an emergency due to communication difficulties and possible mobility challenges; and these individuals often receive less equitable care with more disparate outcomes (Agoratus, 2019; CDC, 2019; CDC, 2015; Constantou et al., 2017; Copenhaver & Tewksbury, 2019; Eide et al., 2018; Fifolt et al., 2016; Healthy People 2020, 2020a; Healthy People 2020, 2020b; Kim & Zakour, 2017; Koeffler et al., 2019; Kreisberg et al., 2016; NCIOM, 2020; Neave-DiToro et al., 2019; Peek & Stough, 2010; Smith & Notaro, 2015; Wolf-Fordham, 2014; Wyte-Lake et al., 2018; Zwaigenbaum et al., 2016). Furthermore, first responders are obligated to prioritize individuals with disabilities during emergencies and disasters, take special care in meeting their needs, and ultimately the Americans with Disabilities Act must be followed (FEMA, 2002; National Council on Disability, 2014; USDHHS, 2019a; USDHHS, 2019b). Specifically, special communication needs must be addressed by first responders in an emergency or natural disaster

(FEMA, 2002; National Council on Disability, 2014; USDHHS, 2019b). Multiple organizations advised healthcare professionals are responsible for assisting families in emergency preparedness (CDC, 2019; CDC, 2015; Fifolt et al., 2016; Kim & Zakour, 2017; Kreisberg et al., 2016; National Council on Disability, 2014; Peek & Stough, 2010; Wyte-Lake et al., 2018).

The Community Awareness Brochure distributed by Community Paramedics and Community Organizations related to this project has the potential to assist individuals with special needs regarding how to make an effective, personalized emergency plan for rapid communication of their emergency information to first responders as recommended by the National Council on Disability (2014). Although there were not any QR code application sign-ups during the project time period, individuals with communication challenges could still sign-up after the project due to distribution of the Community Awareness Brochure. I did not receive a report of the number of brochures distributed by Community Paramedics.

I emailed three different community organizations with missions focused on serving individuals with disabilities, and the county school board with the brochure. I offered to meet virtually. One organization agreed to distribute the brochure by email. I had a virtual meeting with another organization, and they agreed to share the brochure when parents ask for this type of resource, but did not agree to share with their group en masse. I did not receive a count of how many brochures will be distributed, but both organizations stated they planned to continue distributing the brochure after the project ended. This group provided information about their hesitancy, such as previous programs/projects developed by EMS that prioritized “safety over dignity.” For example, this group does not support individuals with disabilities registering with EMS, or putting a sticker on their window for rescue efforts. Earlier knowledge of this would have allowed further dialogue about the meaning and significance of this comment and past

project barriers. This could have led to more fruitful community engagement and partnership. Also, one member of this organization shared emergency information could be included on a person's iPhone, and the individual can select to share this information with EMS during a 911 call. She explained this as a reason why paying for a QR code application might not make sense to their members. The third community organization did not respond. When I emailed the school board, I emailed each member and requested they share the information with special education teachers; however, the school board never responded.

Although, the survey completion rates did not meet the goal, informative descriptive data was obtained from the first responders and community members. This has the potential to inform further study and similar projects with goals related to improving communication between individuals with communication challenges and first responders.

Additionally, the Beginning of Implementation and End of Implementation Surveys had different levels of participation. This could have been related to differing distribution methods. The Beginning of Implementation Survey was shared with participants via the EMS education portal, so they might have assumed their completion was being tracked by supervisors. The End of Implementation Survey was distributed by email as a link embedded in an audio reminder/project update. Participants might have missed this link, or not felt compelled to complete as compared to the Beginning of Implementation Survey. Once the specialty services director closed the Beginning of Implementation Survey in the EMS education portal, I did not have access to share the End of Implementation Survey via the education portal. It was not planned to distribute the surveys differently. In retrospect, it would have been helpful to discuss with the specialty services director the importance of keeping the distribution methods the same.

Section V. Interpretation and Implications

Cost Benefit Analysis

As the project leader and a student, I spent time analyzing the cost benefit of the project for the EMS organization assuming the organization were to complete the project without the assistance of a student. First, a site champion and education coordinator would be needed to develop the program. Additionally, the majority of the staff would need to invest time in completing the narrated education presentation and surveys. The site champion and education coordinator would probably have to spend 30-40 hours developing the narrated education presentation, surveys, researching the project, and connecting with community organizations over the course of a few months. The narrated education presentation completion by EMS first responders would take approximately 12 minutes per EMS first responder. Each survey completion would take approximately 30 minutes for a total of 1 hour per EMS first responder. The overall direct financial cost is minimal. It would cost 5 cents per brochure, if they are printed for an estimated $200 in printing costs. If the brochures were shared electronically, there would not be a printing cost. The time investment translated into actual financial cost would be equal to 1 week of salary for each person planning the project for a total of 2 weeks of salary. After performing a Google search for salary ranges for an EMS director or assistant director, the salary ranges from $70, 000 to $150, 000 per year. If this is who spends time planning the project, the salary cost would range from $2,700 to $5,800 for 2 weeks of work. For the average EMT in North Carolina, the salary ranges from $29,000 to $44,000 per year. If an EMT is the person working on the project, the salary cost would range from $1,100 to $1,700 for 2 weeks of work. To reduce cost the, director could delegate much of the planning to a few EMS first responders that report back. As a result, the total project cost over the course of a year is approximately

$1,900 to $6,000; and this includes salary and printing costs. See Appendix E for the project budget.

The project would help the organization meet Healthy People 2020, NCIOM 2030, CDC, and FEMA goals. The project could decrease the time of response and care for individuals with communication challenges. As a result, EMS first responders could respond to a new call faster, which could save time and money for staffing costs. The project could improve quality care and provide a solution to bridging communication barriers between first responders and community members. Ultimately the project could improve safety and the ability to provide therapeutic, trauma-informed care to individuals with communication challenges. By bridging the communication barrier, the project could create a safer environment for first responders as well. With better communication, tense situations can be de-escalated more efficiently, and allowing for better rapport.

Emotional costs from trauma possibly reduced for community members and first responders; but the actual financial cost of treating physical injuries could be reduced. Additionally, this could decrease costly legal action from community members; and worker's compensation and disability claims from first responders. This could also, decrease the cost of replacing EMS staff from injuries. This could involve not having to pay increased rates of pay for temporary staff members who typically are paid at a higher rate, and not having to pay onboarding costs to train temporary and permanent staff.

The project is in the development stages, so community buy-in has not occurred yet. As a result, EMS has invested time without a guarantee the community will participate and adopt using the QR code application.

The overall financial cost was minimal, so actual money was not spent by the organization. However, work hours invested in the project could be a detriment, if the community does not participate. If EMS continues with this project, it has the potential to provide a good return in the future. Additionally, the project team leader performed much of the planning and invested time to develop the project. As a result, the actual cost to EMS if they continue is less than the cost mentioned above. If community buy-in occurs, this project has the potential to meet benchmarks, improve efficiency in providing safe, therapeutic, trauma informed care to a population that has increased vulnerability in an emergency or disaster.

Resource Management

EMS possesses many non-monetary resources that were an asset to project success. The organization already had an education portal, so it was simple to disseminate the narrated education presentation and track completion of presentation and surveys. Additionally, EMS already has Community Paramedics who follow-up with community members with special needs. These Community Paramedics were able to share community awareness brochures about the project with specific community members who would be served by the intervention. EMS was able to easily email audio messages with project updates to the whole first responder team. Additionally, the Assistant Director who served as the site champion was very invested from the beginning, and had experience completing similar projects. As a result, this is a huge asset to EMS, if they continue the project.

There were some resources EMS did not possess that would have encouraged project success. The ability to have in-person meetings would have been helpful for increased participation. Due to the pandemic in-person meetings were not allowed. Additionally, due to first responders working various shifts around the clock, it would be challenging to coordinate

live in-person meetings. First responders potentially had less time available for a new program amidst a pandemic that specifically impacted most aspects of their work. Potentially, the emotional energy needed to invest in a new program was lacking with likely compassion fatigue and burnout amidst the pandemic, and civil unrest already affecting their daily operations for months.

Next, EMS likely has community organization contacts that could be helpful for encouraging community engagement. I did not specifically ask EMS to share these contacts. In hindsight this would have been helpful if included in the planning stages. Sharing information with other community partners could be a feasible option.

Since the end of implementation, I have been unable to meet with EMS to discuss sustainability. Potentially when the pandemic eases further, the organization could have more time and energy to re-allocate resources towards this type of project.

Implications of the Findings

Implications for Patients

The EMS first responders who completed the narrated education presentation are more aware of QR codes as a possible tool for accessing emergency information for individuals with communication challenges, which could lead to more efficient, safe, and trauma-informed care. After completing the narrated education presentation, awareness has been raised in EMT participants regarding the need to keep the ADA guidelines at the forefront when responding to calls in an emergency or disaster. As a result, individuals with communication challenges have the potential to have better protection of their rights and needs as recommended by ADA guidelines. The project has the potential to bridge the communication barrier between first responders and individuals with communication challenges, which could lead to an overall more

therapeutic interaction and improved health outcomes for the population of individuals with communication challenges. This has the potential to make the interaction between first responders and individuals with communication challenges better. This has the potential to make first responder care more efficient, safe, and less traumatic for an already vulnerable population.

Implications for Nursing Practice

This could lead to a more detailed history prior to a patient arriving for care from nurses and other healthcare professionals. As a result, nurses have the potential to provide more efficient, safe, and trauma informed care for the population of individuals with communication challenges. Nurses could access the QR code to receive emergency medical information for the patients with communication challenges and could be able to contact a caregiver more efficiently.

Impact for Healthcare System(s)

This QR code application uptake can help EMS meet benchmarks set by Healthy People 2020, NCIOM 2030, CDC, FEMA, and the ADA. This is a potential tool to improve communication between the population of first responders and the population of individuals with communication challenges. It also has the potential to assist with the transfer individuals to the appropriate level of care in a more efficient, safe, and therapeutic manner and help first responders save time when they provide report to a hospital where the patient with communication challenges is transported.

Sustainability

Regarding sustainability of this project, I attempted to meet with EMS after implementation to discuss sustainability; however, EMS has been unable to establish a meeting. In lieu of meeting with them and discussing sustainability in a concrete fashion, I will share some assumptions regarding sustainability of the project. The financial cost is minimal, so the organization should be able to sustain the financial cost. The man-power cost should be less now that the project is started. The time invested to develop the program and get it started is the most time consuming. The organization would need to continue spending time educating community members and community organizations, which is time consuming, but could be sustainable. If the Community Paramedics continue sharing the Community Awareness Brochure with community members they already visit, this would make the project much more sustainable. EMS motivation, community buy-in, and ongoing effects of the pandemic will likely affect sustainability. This project might be more sustainable after the effects of the pandemic slow their impact on EMS daily operations. As a result, further efforts for this project could be more sustainable in 1 to 2 years.

Dissemination Plan

Regarding dissemination of project findings, I presented my project poster to the East Carolina University DNP Program Virtual Presentation April 6, 2021. I will also share my project findings via a narrated presentation with my project partner in April 2021. The specialty services director or assistant director of EMS will then distribute the narrated education presentation via email to the whole EMS first responder team in April 2021. I will submit my project paper to the Scholarship database housed in Laupus Library in April 2021, which will allow others in academia to view the project findings. Additionally, I plan to submit my project

findings to a few conferences. I am considering the EMS Today Journal of Emergency Medical Services Conference and Exhibition in August 2021, which is a conference specific to EMS first responders. Since EMS first responders are one of the primary populations of focus, this conference seems particularly beneficial for dissemination. The North Carolina Nurses Association Convention in September 2021 is an important convention, because it would raise awareness for nurses in North Carolina, the location of this project. The North Carolina Public Health Association Conference in October 2021 is an important conference for dissemination, because the project has a public health and population health perspective. See Appendix F for more details.

Section VI. Conclusion

Limitations

This project had several limitations. One major limitation to project development, implementation, evaluation and dissemination has been the COVID -19 pandemic. All of my communications and interactions with the project partner were virtual and I was unable to have reciprocal communication with the EMS first responders. As a result, I continued to record short project updates to distribute to the team.

I suspect the following was a limitation to the project: the added stress and time commitments placed on EMS by challenges from the pandemic, and civil unrest with local and nationwide protests. This likely had a large impact on project engagement from EMS. Ultimately, the pandemic affected every area of the EMS participants' work and work processes. Additionally, despite a very invested site champion, I suspect he and the specialty services director were affected by all of these same stressors both in emotional energy, and time available to contribute to the project.

When starting the community awareness part of the project, I was delayed by initial securing of a partner, and waiting on approval for the community awareness brochure. This ended up leading to an unanticipated barrier to the project. For a future project, it would be more effective to have the community awareness brochure designed and language approved at the beginning of implementation. Once the brochure was approved, I shared the brochure with my project partner, because the assistant director offered to have Community Paramedics share the brochure with community members who they already visited with regularly.

Additionally, during the planning stages I anticipated not being able to attend live community events due to the pandemic. To address this limitation, I contacted several

community organizations with missions and visions focused on helping individuals with disabilities. I emailed 3 community organizations, and the local school board.

Recommendations for Others

For future projects, I have several recommendations that would hopefully lead to enhanced project success. I would research pertinent community organizations to contact prior to implementation. Once the project is approved, I would start contacting community organizations as soon as possible to allow time to achieve buy-in with organizations and the community. Additionally, I recommend developing a detailed community awareness strategy prior to implementation. Specifically, I would create a community awareness brochure in multiple formats (print, electronic, and maybe an audible electronic brochure). This would allow individuals with various communication challenges to access the information.

Next, I would find a way to communicate directly with first responders. This would likely help with project partner engagement and sustainability. Then, I would find a way to provide an incentive for project participation for EMS first responders. Since the project had survey response rates of 18% for the Beginning of Implementation Survey and 8.7% for the End of Implementation survey, I would spend more time researching methods to improve survey response rates. I would put multiple strategies into practice. Some of the EMS first responders did not answer all of the survey questions, so I would make the survey shorter to possibly encourage more participation. Phillips et al. (2016) advised the length of a survey can affect survey participation and completion of all questions. Also, fewer respondents answered the open-ended questions when compared to multiple choice questions. As a result, I would recommend fewer open-ended questions, because this could encourage more participation.

Recommendations Further Study

Regarding recommendations for further study, there are several strategies I would employ. To increase the body of knowledge regarding the communication barrier between first responders and individuals with communication challenges, I would research ways to connect with the population of individuals with communication challenges. It would be helpful to research ways to be sensitive to the needs of the population of individuals with communication challenges. Specifically involving the population during the planning stages would help with information gathering for feasible and acceptable interventions as perceived by the population. It would be helpful to research how individuals with communication challenges prepare for emergencies. Next, I would thoroughly research ways to improve survey response completion prior to administering a survey to participants. Continued efforts are needed to increase first responder awareness of the rights and needs of individuals with communication challenges in an emergency or natural disaster. Additionally, continued efforts are needed to educate first responders and the community regarding strategies that would be useful in decreasing communication barriers between individuals with communication challenges and first responders to bridge these barriers, and ultimately lead to safe, efficient, trauma-informed care.

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Appendix A

QR Code

Scan QR code above to see example of emergency information provided to first responder when they scan the wearable on an individual with communication challenges.

Appendix B

Literature Matrix

Citation	Purpose	Resource Category/ Level of Evidence
Agoratus, L. (2019). How self-advocates and families can deal with health disparities affecting people with disabilities. *Exceptional Parent Magazine, 49*(1) 57-59.	Description and opinions of parents of individuals with disabilities re: strategies to handle disparities	Opinion/ Level VII
[redacted] Health Alliance. (2018). [redacted] *County state of the county health report*.	Description of health in project site county	County Report/ Level VII
Centers for Disease Control and Prevention. (2019). *Keeping children with disabilities safe in emergencies*.	Strategies and recommendations to promote safety for children with disabilities	Recommendation / Opinion/ Level VII
Centers for Disease Control and Prevention. (2015). *Planning for an emergency: Strategies for identifying and engaging at-risk groups. A Guidance document for Emergency Managers: First edition*.	Emergency preparedness planning for individuals with risk of disparate outcomes	Recommendation / Opinion/ Level VII
Constantou, V., Ionnou, A., & Diaz, P. (2017). Inclusive access to emergency services: An action research project focused on hearing-impaired citizens. *Universal Access Information Society, 16*(4), 929-937.	Focuses on individuals with hearing impairment and equitable access to emergency services	Qualitative/ Descriptive Study/ Level VI
Copenhaver, A., & Tewksbury, R. (2019). Interactions between autistic individuals and law enforcement: A mixed-methods exploratory study. *American Journal of Criminal Justice*, 44, 309-333.	Explains how police and law enforcement interact with autistic individuals, who are part of the project population.	Systematic review of descriptive, qualitative studies/ Level V
Eadens, D. M., Cranston-Gingras, A., Dupoux, E. & Eadens, D. W. (2016). Police officer perspectives on intellectual disability. *Policing: An International Journal of Police Strategies & Management, 39*(1), 222-235.	Describes how police officers/first responders view intellectual disabilities.	Single descriptive/ qualitative study/ Level VI

Citation	Purpose	Resource Category/ Level of Evidence
Eide, A. H., Dyrstad, K., Munthali, A., Rooy, G. V., Braathen, S. H., Halvorsen, T., Persendt, F., Peter Mvula, P. & Rød, J. K. (2018). Combining survey data, GIS and qualitative interviews in the analysis of health service access for persons with disabilities. *BMC International Health and Human Rights, 18*(26), 2-8.	Surveys and qualitative data regarding access to health services for individuals with disabilities	Review of descriptive/ qualitative studies/ Level V
Engelman, A. & Deardorff, J. (2016). Cultural competence training for law enforcement responding to domestic violence emergencies with the deaf and hard of hearing: A mixed-methods evaluation. *Health Promotion Practice, 17*(2), 177-185.	Describes training and interaction between law enforcement and individuals with hearing impairment in domestic violence emergencies	Single descriptive/ qualitative study/ Level VI
FEMA. (2002). *Orientation manual for first responders on the evacuation of people with disabilities*.	Discusses guidelines, recommendations, ADA legal guidance for prioritizing individuals with disabilities and mobility challenges during an emergency/ natural disaster	Expert Opinion/ Level VII
Fifolt, M., Wakelee, J., Eldridge-Auffant, L., Carpenter, R., Hites, L. (2016). Addressing the needs of adults and children with disabilities through emergency preparedness and organizational improvisation. *Nonprofit Management & Leadership, 27*(3), 423-434.	Discusses using preparation to practice emergency preparedness for all ages of individuals with disabilities	Single descriptive/ qualitative study/ Level VI
Healthy People 2020. (2020a). *Access to health services*.	Discusses access to healthcare for individuals with disabilities and communication challenges	Expert Opinion/ Recommendation / Level VII
Healthy People 2020. (2020b). *Disability and health*.	Provides recommendations and goals for improving the health outcomes of individuals with disabilities	Expert Opinion/ Recommendation / Level VII
Healthy People 2020. (2020c). *Health communication and health information technology*.	Provides recommendations and goals for using communication and health IT to improve health outcomes for individuals with disabilities and communication challenges	Expert Opinion/ Recommendation / Level VII

Citation	Purpose	Resource Category/ Level of Evidence
Institute for Healthcare Improvement. (2020a). *IHI triple aim initiatives: Better care for individuals, better health for populations, and lower per capita costs*.	Discusses the Triple Aim, improving quality care, decreasing cost, and improving health outcomes with regards to population health	Expert Opinion/ Recommendation / Level VII
Institute for Healthcare Improvement. (2016). *PDSA worksheet (short version).*	PDSA model for healthcare quality improvement projects. Provides a worksheet to guide each PDSA cycle during the project	Expert Opinion/ Level VII
Institute for Healthcare Improvement. (2020b). *Triple aim for populations*.	Discusses the Triple Aim for populations, including individuals with disabilities and children.	Expert Opinion/ Level VII
Institute on Disability. (2018). *2015 State report for county-level data: Prevalence*.	Discusses health statistics and population statistics for project site community.	Expert/ Government Report/ Level VII
Kelly, E. & Hassett-Walker, C. (2016). The Training of New Jersey emergency service first responders in autism awareness. *Police Practice and Research, 17*(6), 543-554.	Training guide for first responders when encountering individuals with autism	Expert Opinion/ Recommendation / Level VII
Kim, H. & Zakour, M. (2017). Disaster preparedness among older adults: Social support, community participation, and demographic characteristics. *Journal of Social Service Research, 43*(4), 498-509.	Discusses emergency/ disaster preparedness strategies and challenges for the elderly	Single descriptive/ qualitative study/ Level VI
Koeffler, T. J., Demeter, N. E., Kysh, L., Reeb, J., Stayton, A., Spears, & R. Burke, R. V. (2019). Evaluation and gap analysis of pediatric disaster preparedness resources. *Disaster Medicine and Public Health Preparedness, 13*(2), 330-337.	Discusses what resources and recommendations exist for emergency preparedness for children in natural disasters	Systematic review of descriptive/ qualitative studies/ Level V
Kreisberg, D., Thomas, D. S. K., Valley, M., Newell, S., Janes, E., & Little, C. (2016). Vulnerable populations in hospital and health care emergency preparedness planning: A comprehensive framework for inclusion. *Prehospital Disaster Medicine, 31*(2), 211-219.	Discusses healthcare professionals having a responsibility to help individuals with disabilities and communication challenges with emergency preparedness strategies	Expert Opinion/ Recommendation / Level VII

Citation	Purpose	Resource Category/ Level of Evidence
National Council on Disability. (2014). *Effective communications for people with disabilities: Before, during, and after emergencies*.	Discusses communication strategies surrounding emergencies for individuals with disabilities	Expert Opinion/ Recommendation / Level VII
Neave-DiToro, D., Fuse, A., & Bergen, M. (2019). Law enforcement interactions: The Role of communication sciences and disorders professionals. Communication Disorders Quarterly, 40(4), 250–256.	Discusses when law enforcement/first responders should use translators and other non-law enforcement professionals in an emergency response	Expert Opinion/ Level VII
North Carolina Institute of Medicine. (2020). *Healthy North Carolina 2030: A path toward health*.	Provides goals for improving health outcomes in North Carolina.	Expert Opinion/ Recommendation / Level VII
Nousaine, M., Beam, M. & Thomas, L. (2016). [redacted] *community needs assessment*.	County community needs assessment including description of health indicators, resources, and priority areas for improvement	Expert/ Government Report/ Level VII
Peek, L. & Stough, L. (2010). Children with disabilities in the context of disaster: A social vulnerability perspective. *Child Development, 81*(4), 1260-1270.	Discusses emergency preparedness for children with disabilities	Systematic review of descriptive/ qualitative studies/ Level V
Smith, D. L. & Notaro, S. J. (2015). Is emergency preparedness a 'disaster' for people with disabilities in the US? Results from the 2006–2012 Behavioral Risk Factor Surveillance System (BRFSS). *Disability & Society, 30*(3), 401-418.	Evaluates risk factors for individuals with disabilities in an emergency	Single descriptive/ qualitative study/ Level VI
United States Census Bureau. (2019). *QuickFacts* [redacted] *County, NC*.	Provides statistical data on individuals with disabilities in the project site county	Expert/ Government Report/ Level VII
U. S. Department of Health and Human Services. (2019a). *At-risk individuals*.	Discusses individuals with disabilities and communication challenges in emergencies and natural disasters	Expert Opinion/ Recommendation / Level VII
U. S. Department of Health and Human Services. (2019b). *FEMA's functional needs support services guidance*.	Provides recommendations regarding prioritizing individuals with disabilities and communication challenges in emergencies and natural disasters	Expert Opinion/ Recommendation / Level VII

Citation	Purpose	Resource Category/ Level of Evidence
Weiner, B. J., Lewis, C. C., Stanick, C., Powell, B. J., Dorsey, C. N., Clary, A. S., Boynton, M. H., & Halko, H. (2017). Psychometric assessment of three newly developed implementation outcome measures. *Implementation Science, 12*(108), 1-12.	Used for survey tool with reliability and validity for Likert style questions	Case/Cohort study/ Level IV
Wolf-Fordham, S. B., Twyman, J. S., & Hamad, C. D. (2014). Educating first responders to provide emergency services to individuals with disabilities. *Disaster Medicine and Public Health Preparedness, 8*, 533-540.	Discusses providing emergency/disaster preparedness training to first responders when responding to individuals with disabilities	Single descriptive/ qualitative study/ Level VI
Wyte-Lake, T., Claver, M., Der-Martirosian, C., Davis, D., & Dobalian, A. (2018). Education of elderly patients about emergency preparedness by health care practitioners. *American Journal of Public Health, 108*, S207-S208.	Discusses how healthcare professionals must help the elderly learn how to make an individualized emergency preparedness plan	Single descriptive/ qualitative study/ Level VI
Zwaigenbaum, L., Nicholas, D. B., Muskat, B., Kilmer, C., Newton, A. S., & Craig, W. R. (2016). Perspectives of health care providers regarding emergency department care of children and youth with autism spectrum disorder. *Journal of Autism and Developmental Disorders,* 46(5).	Discusses the interaction of healthcare professionals and first responders with individuals with autism in an emergency	Single descriptive/ qualitative study/ Level VI

Appendix C

Surveys

Survey C1. Beginning of QR Code Project Survey

Weiner et al.'s (2017) Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) and additional questions

Q1. Using a mobile device to access a QR Code for individuals with communication challenges seems fitting.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Q2. Using a mobile device to access a QR Code for individuals with communication challenges seems suitable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Q3. Using a mobile device to access a QR Code for individuals with communication challenges seems applicable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q4. Using a mobile device to access a QR Code for individuals with communication challenges seems like a good match.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q5. Using a mobile device to access a QR Code for individuals with communication challenges seems implementable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Q6. Using a mobile device to access a QR Code for individuals with communication challenges seems possible.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q7. Using a mobile device to access a QR Code for individuals with communication challenges seems doable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q8. Using a mobile device to access a QR Code for individuals with communication challenges seems easy to use.

- Completely agree

- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q9. What is your age in years?

- 18-19
- 20-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-69
- 70+

Q10. What is your gender?

- Male
- Female
- Transgender
- Choose to not identify

Q11. What is your race or ethnicity?

- Asian
- Black or African American
- Hispanic or Latino

- Middle Eastern or North African
- Multiracial or Multiethnic
- Native American or Alaska Native
- Native Hawaiian or other Pacific Islander
- White or Caucasian
- Another race or ethnicity

Q12. How many years have you worked as a first responder?

- 0-1 year
- 2-4 years
- 5-9 years
- 10-14 years
- 15-19 years
- 20-24 years
- 25-29 years
- 30+ years

Q13. Do you have experience interacting with non-communicative/communication challenged individuals outside of your work duties? If so, please describe.

Q14. Estimate how many times you interact with a non-communicative/communication challenged individual in the average month during the course of your work duties?

- Never
- 1
- 2-4
- 5-9
- 10+

Q15. Describe the demographics of non-communicative/communication challenged individuals you encounter during the course of your work duties ie. (gender, age, race, reason or diagnosis for communication challenge)?

Q16. Describe the challenges you have when responding to a non-communicative/communication challenged individual while carrying out your work duties?

Q17. How do you typically obtain emergency information from a non-communicative/communication challenged individual?

Q18. When responding to a call, how often does the non-communicative/communication challenged person have a QR code for emergency information?

- Extremely Often
- Often
- Occasionally
- Rarely
- Extremely Rarely
- Never

Q19. Did the QR code make responding to the non-communicative/communication challenged individual more or less efficient?

- Much more efficient
- More efficient
- Neither more nor less efficient
- Less efficient
- Much less efficient

Q20. Have you ever responded to a call when a person had a QR code for emergency information?

- Yes
- No

Q21. Was the QR code helpful, not helpful, or neutral effect?

- Extremely helpful
- Very helpful
- Somewhat helpful

- Neutral effect
- Not so helpful
- Not at all helpful
- Not applicable

Q22. How easy was it to access the QR code?

- 1 Extremely easy
- 2 Easy
- 3 Neither easy nor difficult
- 4 Difficult
- 5 Extremely difficult

Q23 Did you have challenges accessing the QR code? If so, what caused the challenge?

Q24 Would you recommend a non-communicative/communication challenged individual use QR code technology for emergency preparedness?

- Yes
- No

Survey C2. End of QR Code Project Survey

Weiner et al.'s (2017) Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) and additional questions

Instructions: Everyone should take this survey, including those who took the Beginning of QR Code Project Survey.

This End of Project survey will be open until 11/17/20.

Q1. Using a mobile device to access a QR Code for individuals with communication challenges seems fitting.

- Completely agree
- Agree
- Neither agree nor disagree

- Disagree
- Completely Disagree

Q2. Using a mobile device to access a QR Code for individuals with communication challenges seems suitable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Q3. Using a mobile device to access a QR Code for individuals with communication challenges seems applicable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q4. Using a mobile device to access a QR Code for individuals with communication challenges seems like a good match.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q5. Using a mobile device to access a QR Code for individuals with communication challenges seems implementable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree

- Completely Disagree

Q6. Using a mobile device to access a QR Code for individuals with communication challenges seems possible.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q7. Using a mobile device to access a QR Code for individuals with communication challenges seems doable.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q8. Using a mobile device to access a QR Code for individuals with communication challenges seems easy to use.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely disagree

Q9. What is your age in years?

- 18-19
- 20-24
- 25-29
- 30-34
- 35-39

- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-69
- 70+

Q10. What is your gender?

- Male
- Female
- Transgender
- Choose to not identify

Q11. What is your race or ethnicity?

- Asian
- Black or African American
- Hispanic or Latino
- Middle Eastern or North African
- Multiracial or Multiethnic
- Native American or Alaska Native
- Native Hawaiian or other Pacific Islander
- White or Caucasian
- Another race or ethnicity

Q12. How many years have you worked as a first responder?

- 0-1 year
- 2-4 years
- 5-9 years
- 10-14 years

- 15-19 years
- 20-24 years
- 25-29 years
- 30+ years

Q13. Do you have experience interacting with non-communicative/communication challenged individuals outside of your work duties? If so, please describe.

Q14. Estimate how many times you interact with a non-communicative/communication challenged individual in the average month during the course of your work duties?

- Never
- 1
- 2-4
- 5-9
- 10+

Q15. Describe the demographics of non-communicative/communication challenged individuals you encounter during the course of your work duties ie. (gender, age, race, reason or diagnosis for communication challenge)?

Q16. Describe the challenges you have when responding to a non-communicative/communication challenged individual while carrying out your work duties?

Q17. How do you typically obtain emergency information from a non-communicative/communication challenged individual?

Q18. When responding to a call, how often does the non-communicative/communication challenged person have a QR code for emergency information?

- Extremely Often
- Often
- Occasionally
- Rarely
- Extremely Rarely

- Never

Q19. Did the QR code make responding to the non-communicative/communication challenged individual more or less efficient?

- Much more efficient
- More efficient
- Neither more nor less efficient
- Less efficient
- Much less efficient
- Not applicable I have not encountered a QR code when responding to an EMS call

Q20. Have you ever responded to a call when a person had a QR code for emergency information?

- Yes
- No

Q21. Was the QR code helpful, not helpful, or neutral effect?

- Very helpful
- Somewhat helpful
- Neutral effect
- Not so helpful
- Not at all helpful
- Not applicable I have not encountered a QR code when responding to an EMS call

Q22. How easy was it to access the QR code?

- 1 Extremely easy
- 2 Easy
- 3 Neither easy nor difficult
- 4 Difficult
- 5 Extremely difficult
- 6 Not applicable I have not encountered a QR code when responding to an EMS call

Q23. Did you have challenges accessing the QR code? If so, what caused the challenge?

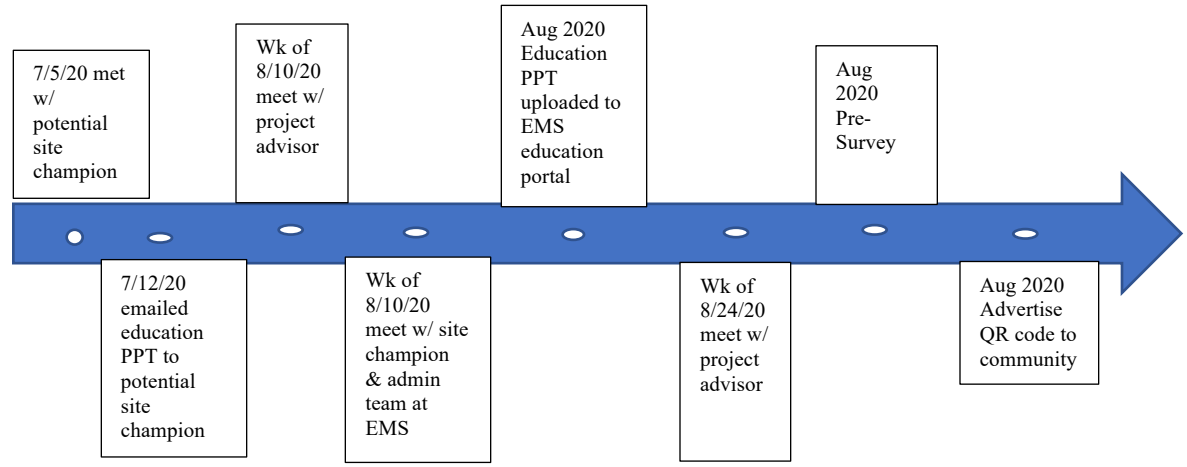
Q24. Would you recommend a non-communicative/communication challenged individual use QR code technology for emergency preparedness?

- Yes
- No

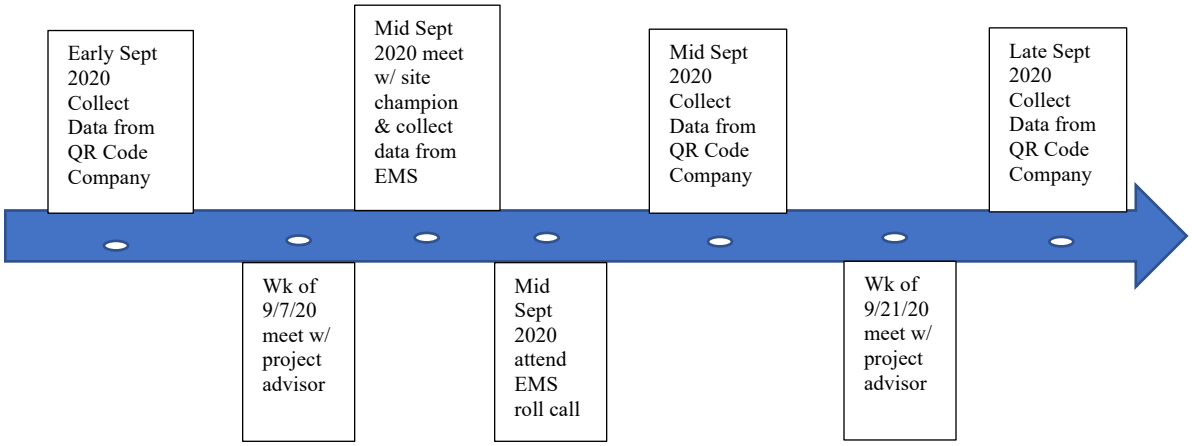
Appendix D

Timeline

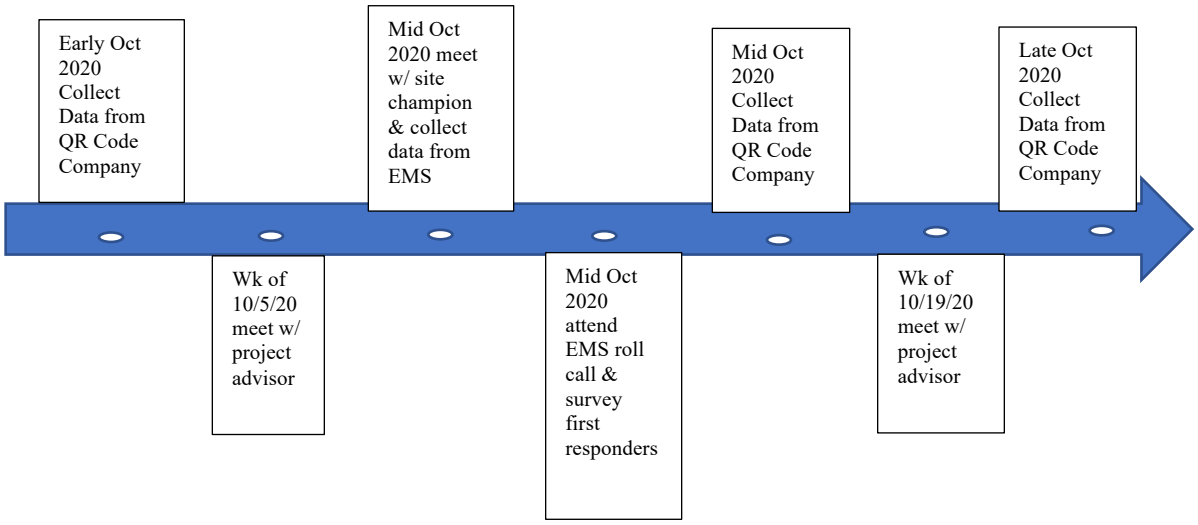
July/August 2020 Timeline



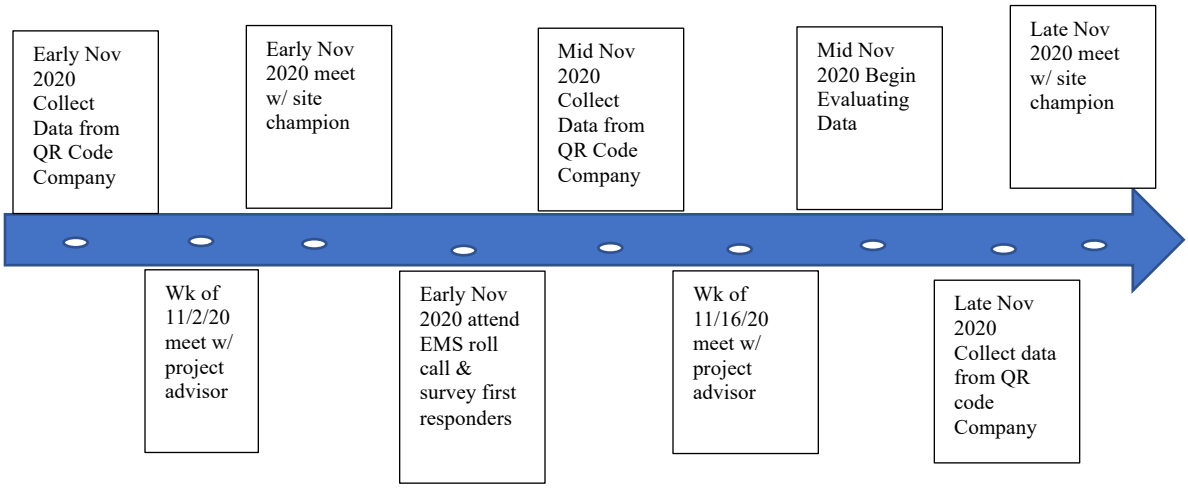
September 2020 Timeline



October 2020 Timeline



November 2020 Timeline



Appendix E

Project Budget

Line Item	Unit Cost	Quantity	Total Cost per Year
Community Awareness Brochure Printing	$0.05	4,000 copies	$200.00
Salary for EMS Assistant Director	$1,350.00 - $2,900.00	2 weeks	$2,700.00 - $5,800.00
Salary for EMS first responders	$550.00 - $850.00	2 weeks	$1,100.00 - $1,700.00
Total Cost of Project per Year			If tasks performed by EMS Assistant Director: $2,900.00 - $6,000.00 If tasks performed by EMS first responders: $1,200.00 - $1,900.00

Appendix F

Dissemination Plan

- ECU DNP Project Virtual Presentation April 2021
- [redacted] County EMS Virtual Presentation April 2021
- Paper uploaded to the Scholarship April 2021

The following are possible conferences for dissemination

- North Carolina Public Health Association October 2021 (from 2020 dates: Abstract due 8/15/2020, Notice of acceptance 9/11/2020, Notice to planning committee intent to present 9/18/2020) https://ncpha.memberclicks.net/abstract-submission
- EMS Today The JEMS Conference and Exhibition 8/24-8/27/2021 San Antonio, Tx. Accepts exhibitors. https://www.emstoday.com/exhibition/become-an-exhibitor
- Annual NCNA Convention September 23-24, 2021

  Embassy Suites by Hilton Charlotte-Concord Golf Resort & Spa

  Concord, NC https://ncnurses.org/events/calendar-at-a-glance/2021-annual-ncna-convention/

Appendix G

Doctor of Nursing Practice Essentials

	Description	Demonstration of Knowledge
Essential I ***Scientific Underpinning for Practice***	**Competency** – Analyzes and uses information to develop practice **Competency** -Integrates knowledge from humanities and science into context of nursing **Competency** -Translates research to improve practice **Competency** -Integrates research, theory, and practice to develop new approaches toward improved practice and outcomes	I spent time analyzing and reviewing previous research related to interventions used to improve communication for individuals with communication challenges. I researched recommendations and guidelines for first responders based on evidence based practice to improve the communication barrier between first responders and individuals with communication challenges.
Essential II ***Organizational & Systems Leadership for Quality Improvement & Systems Thinking***	**Competency** –Develops and evaluates practice based on science and integrates policy and humanities **Competency** –Assumes and ensures accountability for quality care and patient safety **Competency** -Demonstrates critical and reflective thinking **Competency** -Advocates for improved quality, access, and cost of health care; monitors costs and budgets **Competency** -Develops and implements innovations incorporating principles of change **Competency** - Effectively communicates practice knowledge in writing and orally to improve quality **Competency** - Develops and evaluates strategies to manage ethical dilemmas in patient care and within health care delivery systems	I researched current policies provided by Healthy People 2020, NCIOM 2030, the CDC, and FEMA in order to advocate for the rights and needs of individuals with communication challenges in emergency and natural disaster response. Developed a program using QR code technology as a strategy to bridge communication barriers between individuals with communication challenges and first responders.
Essential III ***Clinical Scholarship & Analytical Methods for Evidence-Based Practice***	**Competency** - Critically analyzes literature to determine best practices **Competency** - Implements evaluation processes to measure process and patient outcomes **Competency** - Designs and implements quality improvement strategies to promote safety, efficiency, and equitable quality care for patients **Competency** - Applies knowledge to develop practice guidelines **Competency** - Uses informatics to identify, analyze, and predict best practice and patient outcomes **Competency** - Collaborate in research and disseminate findings	I performed an extensive literature review using clinical scholarship and analytical methods for evidence based practice as I reviewed research on the problem of individuals with communication challenges having a difficult time understanding and communicating back to first responders. Additionally, I found individuals with communication challenges have a difficult time responding to the Emergency Alert System. I found recommendations exist to provide emergency information in a variety of formats to reach individuals with a variety of

		unique communication and mobility challenges.
Essential IV ***Information Systems – Technology & Patient Care Technology for the Improvement & Transformation of Health Care***	**Competency** - Design/select and utilize software to analyze practice and consumer information systems that can improve the delivery & quality of care **Competency** - Analyze and operationalize patient care technologies **Competency** - Evaluate technology regarding ethics, efficiency and accuracy **Competency** - Evaluates systems of care using health information technologies	My project specifically focused on using QR code application technology to help individuals with communication challenges store and update emergency information. The project focused on educating first responders about the technology, and how to use the technology while responding to EMS calls. I also, used virtual meeting applications to meet with my project partner, community organizations, and my faculty team.
	Description	**Demonstration of Knowledge**
Essential V ***Health Care Policy of Advocacy in Health Care***	**Competency**- Analyzes health policy from the perspective of patients, nursing and other stakeholders **Competency** – Provides leadership in developing and implementing health policy **Competency** –Influences policymakers, formally and informally, in local and global settings **Competency** – Educates stakeholders regarding policy **Competency** – Advocates for nursing within the policy arena **Competency**- Participates in policy agendas that assist with finance, regulation and health care delivery **Competency** – Advocates for equitable and ethical health care	Since my project focused on bridging the communication barrier between first responders and individuals with communication challenges who are particularly vulnerable in an emergency, I advocated for improving patient outcomes for this population. I looked at ADA, CDC, and other organizations for guidance in expectations for providing equitable care to this population.
Essential VI ***Interprofessional Collaboration for Improving Patient & Population Health Outcomes***	**Competency**- Uses effective collaboration and communication to develop and implement practice, policy, standards of care, and scholarship **Competency** – Provide leadership to interprofessional care teams **Competency** – Consult intraprofessionally and interprofessionally to develop systems of care in complex settings	I used inter and intraprofessional collaboration to build a partnership with EMS after communicating with other potential organizations. I communicated interprofessionally with my faculty and other students working on a similar project. Additionally, I communicated with the owner of the QR code application company on several occasions to get the project started, and to collect data. I communicated with several community organizations to raise community awareness about the project.
Essential VII ***Clinical Prevention & Population***	**Competency**- Integrates epidemiology, biostatistics, and data to facilitate individual and population health care delivery	I researched the population of individuals with communication challenges, their vulnerabilities,

Health for Improving the Nation's Health	**Competency** – Synthesizes information & cultural competency to develop & use health promotion/disease prevention strategies to address gaps in care **Competency** – Evaluates and implements change strategies of models of health care delivery to improve quality and address diversity	and resources in emergencies and natural disasters. I researched recommendations for providing equitable care for this population. I also researched the first responder population and their resources and lack of resources when interacting with individuals with communication challenges. I worked on a program development project designed to contribute to providing trauma informed care for these populations.
Essential VIII ***Advanced Nursing Practice***	**Competency**- Melds diversity & cultural sensitivity to conduct systematic assessment of health parameters in varied settings **Competency** – Design, implement & evaluate nursing interventions to promote quality **Competency** – Develop & maintain patient relationships **Competency** –Demonstrate advanced clinical judgment and systematic thoughts to improve patient outcomes **Competency** – Mentor and support fellow nurses **Competency**- Provide support for individuals and systems experiencing change and transitions **Competency** –Use systems analysis to evaluate practice efficiency, care delivery, fiscal responsibility, ethical responsibility, and quality outcomes measures	I learned from a community organization how to value the needs of a diverse population at the beginning of a project. I learned the importance of soliciting this feedback early on in a project in order to engender respect and buy-in from the population. Additionally, the population of individuals with communication challenges has much valuable knowledge to share with others who do not have the same challenges. From EMS surveys, it became clear the population of individuals with communication challenges is quite diverse including the exceptionally young, children with disabilities, individuals of all ages with disabilities, the elderly, individuals with autism, individuals with Alzheimer's and other dementias, and individuals who speak English as a second language.