Using QR Codes to Streamline Emergency Service Processes

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Abstract

Persons with communication disabilities experience a true health disparity during emergency situations as their ability to communicate with first responders is limited. It was the goal of this DNP project to help eliminate those disparities through the use of scannable QR codes. Through a partnership with the local fire department, EMS, and a QR code company there was an increase awareness as well as usage of these scannable QR codes which hold crucial information which may improve emergency service processes and the overall health outcomes experienced by those with communication disabilities in the event of an emergency. Secondary to the COVID-19 pandemic, the project was not as successful as originally hoped however successes were still noted.

Keywords: QR code, emergency service processes, communication disability, health disparity, wearable technology

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Section I. Introduction

Background

You're driving to work at seven o'clock on a Monday morning, cars are honking, it's raining, and traffic is bumper to bumper at 70 miles per hour. Suddenly, a truck in front of you loses control and strikes the car next to it, sending it careening across lanes, destroying everything in its path. Luckily, for those affected, you've been a first responder for 15 years. You pull to the side of the road and jump out of your car as quickly as possible, eager to assist those in need. Upon arrival at the first vehicle involved, the driver is unconscious with a crying child in the back seat. The child appears to be eight or nine years old, but you can't seem to get him to communicate with you. What can you do? All attempts to converse with the child are futile and he is becoming more anxious, fear is pouring from his eyes. If only there was a means for you to console the child; to know his name is Eli, that he is severely autistic, and his teddy bear "George" (who sits only 3 feet away) can mend boo-boos, heal broken spirits, and calm even the roughest seas!

First responders often find themselves in circumstances like this. Unfortunately, all persons are not able to communicate their needs effectively in emergency situations. Medical conditions which affect the ability to communicate do not discriminate. Dementia, aphasia from a previous cerebrovascular accident, hypoglycemia, seizure disorders, autism, muscular dystrophy, and cerebral palsy are only a few of the countless disease processes which may encumber effective communication skills. Consequently, there is a clear necessity to develop an efficient, consistent, readily accessible application which provides first responders with vital information essential to care for those who are incapable of affirming their needs. In rural areas such as Beaufort County, which will be my county of focus, applications such as these may be

even more valuable as medical assistance is often farther away. Timely administration of medical care to these populations is not only necessary, it is their right and our civic responsibility as medical providers. We must disrupt any barriers which impede us from rendering this level of care.

> A customer is the most important visitor on our premises, he is not dependent on us. We are dependent on him. He is not an interruption in our work. He is the purpose of it. He is not an outsider in our business. He is a part of it. We are not doing him a favor by serving him. He is doing us a favor by giving us an opportunity to do so.
>
> –Author unknown, believed to be Mahatma Gandhi

Organizational Needs Statement

First responders need access to crucial medical and/or guardianship information for patients who are unable to effectively communicate due to a physical, cognitive, developmental, or genetic disorder. The inability to effectively communicate with first responders leaves these patients at higher risk of delay in care and adverse health events (Boggs, 2019). Healthy People 2020 and Healthy North Carolina 2020 discuss hearing and other sensory or communication disorders directly and there are several leading health indicators which may be related to these topics (North Carolina Department of Health and Human Services [NCDHHS] Division of Public Health, 2019; Office of Disease Prevention and Health Promotion [ODPHP], 2020a, 2020b). According to Healthy People 2020 "at least 1 in 6 Americans has or will have a sensory or communication disorder in his or her lifetime" (ODPHP, 2020b, para. 2). Persons with communication disabilities frequently have greater than one chronic condition and report fair and/or poor health in comparison to those who do not experience communication disabilities (Stransky et al., 2018).

The Kaiser Family Foundation (2020) discusses non-institutionalized individuals of all ages who are reported as having a disability. While simply having a disability does not indicate

an inability to communicate, it does aid in narrowing down the population which may be affected. It is reported that in North Carolina 5.9% of those ages 0-17 years, 11.0% of those ages 18-64 years, 26.1% of those ages 65-74 years, and 50.2% of those age 75 years and older report disabilities (Kaiser Family Foundation, 2020). In order to best serve my community, I will focus my time and attention to Beaufort County, North Carolina.

Beaufort County, North Carolina comprises 958 square miles and a population of 47,759, according to the 2010 Census (United States Census Bureau, 2010). It is located within Regions 9 and 10 of the North Carolina Association of Local Health Director Regions. The Behavioral Risk Factor Surveillance System (BRFSS), which conducts an annual survey concerning various health determinants, had 694 survey participants from Regions 9 and 10 in 2018 with a confidence interval of 95% (NCDHHS, 2018). According to the 2018 BRFSS survey results, 33.1% of the population of Regions 9 and 10 reported "yes" to at least one of the six functional disability status questions, while 66.9% reported "no" to all six questions (NCDHHS, 2018). Functional disability may be defined as any cognitive, physical, mental, or emotional functioning deficit which hampers a person's capacity to communicate or perform basic activities of daily living autonomously. As this represents a large percentage of the population, it demonstrates a true need for an application available for use by first responders of Beaufort County to aid in the identification and care of these persons.

The Triple Aim framework developed by the Institute for Healthcare Improvement (IHI) speaks to the pursuance of improvement of health care from three perspectives: the patient experience of care, the health of populations, and reduction in per capita cost of health care (Institute for Healthcare Improvement, 2020). It is the intention of this DNP project to fulfill all three dimensions of the Triple Aim framework, reducing and/or eliminating the disparities

experienced by those with communication disabilities secondary to physical, cognitive, developmental, or genetic disorder.

Problem Statement

There is an inability to effectively and efficiently communicate with children and adults who have developmental, intellectual, cognitive, and other disorders during emergencies. Due to this inability to communicate, first responders lack important, even life-saving, personal and healthcare information that can impact outcomes for the individuals for whom they are caring.

Purpose Statement

The purpose of this DNP project was to provide first responders a means to easily access crucial information related to guardianship and healthcare for children and adults who may not be able to effectively communicate their needs during emergency situations.

Section II. Evidence

Literature Review

The literature search strategy for the DNP project included the topic of communication disabilities and the use of QR codes in health care settings. CINAHL, PubMed, and Google Scholar were scoured for articles, personal essays, professional opinions, and textbooks which related to either QR code use and/or care of persons with communication disabilities.

MESH terms included in the literature search were QR code, health care, emergency, disability, medical, wearable, electronic, paramedics, intellectual difficulties, autism, first responder, and communication disability. Limitations were then applied: published between 2016 and 2020, English language, full text available, abstract available, and geographical region: USA. Through these terms and limitations, 271 total articles were discovered. Reading the abstracts of the articles allowed me to further narrow my search, finding 11 articles which were suitable to the project focus, primarily pertaining to persons with communication disabilities in emergency situations. Articles related to both communication disabilities and wearable QR codes were limited. Articles were excluded if they were unrelated to medical uses of QR codes or if they did not pertain to persons who experience communication difficulty.

Levels of evidence included in this literature review were III-VII. A lack of previous studies and randomized controlled trials related to QR code use in persons with communication disabilities prevented the use of higher levels of evidence. The 11 articles which were deemed suitable were read in their entirety.

Current State of Knowledge

Overall, the search found little literature focused on QR code use to help patients with communication disorders. QR code use to access personal medical information is fairly novel

and is perceived as perilous by some secondary to security concerns. QR code use is becoming prevalent as health care technology continues to evolve. QR codes allow for rapid access to software applications which can hold viable protected health information crucial in life-threatening situations (Hong & Sinha, 2018; Jamil, 2019; Morales et al., 2016; Piibe et al., 2019).

Communication disabilities, however, have been researched more thoroughly. Those with communication disabilities experience a higher prevalence of health disparities than those who do not report a communication disability (Boggs, 2019; Stransky et al., 2018; Stransky & Morris, 2019). Educating first responders to communicate effectively with persons diagnosed with communication disabilities is obligatory to provide the highest level of care possible (Boggs, 2019; Cheung et al., 2019; Crawford, 2018; Jones, 2018; Stephens, 2018).

Current Approaches to Solving Population Problem(s)

A suitable intervention to alleviate the identified problem of communicating with persons experiencing communication disabilities in emergency settings would be to provide proper education to first responders regarding the possibility of the presence of wearable QR codes which may contain pertinent medical information. Educating persons with communication disabilities and their guardians of the availability of wearable QR codes which hold pertinent medical information may lead to an increase in those who obtain and wear these codes, thereby increasing the efficacy with which first responders identify and communicate with these persons.

Evidence to Support the Intervention

Engaging first responders in education focused on effective communication with persons who have communication disorders may improve efficiency of identification processes and optimization of necessary care (Boggs, 2019; Cheung et al., 2019; Crawford, 2018; Stephens, 2018). Education combined with the use of advanced technology, like QR codes, may lead to a

reduction in avoidable adverse events and improvement in the health disparities experienced by those with communications disabilities (Stransky et al., 2018; Stransky & Morris, 2019). Persons with communication disabilities experience a higher rate of chronic conditions, are more likely to experience medical errors, and rarely receive quality emergency care secondary to communication barriers (Stransky & Morris, 2019). In order to eliminate the health disparities experienced by persons with communication disabilities, a multidimensional approach is essential to encompass all aspects of care in an equitable manner.

Evidence-Based Practice Framework

Identification of the Framework

The project was planned and implemented using the Community Action Model. The Community Action Model uses a five-step process integrating skill-based training, action research, analysis, policy development, and implementation to eliminate health disparities (Hennessey et al., 2005). The primary goal of the Community Action Model is the utilization of members within the community to create community-wide change rather than asking individuals to change and provides assistance in making those changes (Hennessey et al., 2005). Educating first responders of the use of wearable QR codes through skill-based training and allowing them to take action within their communities to provide efficient care to those who experience communication disabilities will lead to future policy development and further implementation of the use of QR codes. Continual action research and analysis was necessary throughout implementation to ensure continued success within the community.

Ethical Consideration and Protection of Human Subjects

Federal regulations define research as a methodical examination designed to cultivate generalizable knowledge through development, testing, and evaluation (Hicks, 2019b). CITI

modules pertaining to social/behavioral research investigators and key personnel were completed. While this DNP project aimed to cultivate knowledge within the first responder community regarding QR code use, it was not the intention for it to be a research project. Streamlining emergency services processes using QR codes through quality improvement methods of thorough education and community involvement did not require IRB approval. Completion of the quality self-assessment tool provided assurance no IRB review was necessary.

Persons with communication disabilities range in age from children to the elderly, both of which are considered members of vulnerable populations by the IRB. Persons with communication disabilities may be incapable of providing consent to QR code services which leads to ethical considerations. It was necessary to obtain consent, at times, from their guardians when they are unable to do so themselves. Informed consent is discussed extensively in the CITI modules (Hicks, 2019a). Although this DNP project was not considered research, it was still crucial to protect those who were involved in the project and to obtain consent from either the participating party or their guardian. The use of QR codes as a process improvement intervention was equal and equitable to all those who were involved with the project no matter age or underlying reason for their communication disability. While the QR codes may be scanned by anyone with a smartphone, the participant or guardian controlled what information is available through the application. This safeguarded all personal information, eliminating the risk for abuse of their protected health information and maintaining confidentiality.

Section III. Project Design

Project Site and Population

The project site was a local fire department in rural eastern North Carolina. This fire department serves approximately 10,000 citizens. The fire department serves as the home for local fire and EMS and works closely with the local police department. There were two populations which were targeted in the project; first responders and persons with communication disabilities. Facilitators of the project were knowledge regarding the project setting and population. A barrier of the project was the limited sample size secondary to a rural setting.

Description of the Setting

The setting of the project involved a rural county in eastern North Carolina. The county population is approximately 50,000. The local community served by this fire department and EMS facility has approximately 10,000 citizens. The county is the fifth largest in North Carolina by total area, covering 827 square miles, however it is 55th for total population (Beaufort County Public Health, 2018). Persons who are 65 years and older comprise 22.7% of this county's population in comparison to North Carolina's overall percentage of 15.5% (Beaufort County Public Health, 2018). The median household income of this community is $40,906, extending far below that of North Carolina's median household income average of $48,256 (Beaufort County Public Health, 2018). While North Carolina's rate of people living below poverty level is 16.8%, this county experiences a rate of 17.5% (Beaufort County Public Health, 2018). Even more disheartening is that 36.6% of persons with a disability are living in poverty within this county, in comparison to North Carolina's 29% (Beaufort County Public Health, 2018).

Description of the Population

The target population included both first responders (fire fighters, EMS, and police) and subjects who choose to partake in the wearable QR code technology. It was the goal to target those with communication disabilities caused from various disease processes such as cerebrovascular accident, Down syndrome, muscular dystrophy, autism, and dementia. Targeting persons with communication disabilities intended to streamline emergency service processes through scanning of wearable QR codes which contain vital medical information necessary to properly care for an individual who may not be able to communicate their needs. First responder's role within this project was knowledge of the potential for an injured person to be wearing this scannable technology and to quickly assess their presence.

Project Team

The project team included myself, faculty mentor, Dr. Janet Tillman, the Chief of the local fire department, and the firefighters, EMS, and police of a rural eastern North Carolina community. In addition to the community partnership, there was also partnership with a company who supplies wearable QR codes which hold crucial information which can be scanned by any smart device. Community involvement through increased awareness was also crucial to the success of this project.

Project Goals and Outcome Measures

The goal of this DNP project was to increase the population's utilization of technology through the use of a wearable QR code which contains crucial information, allowing first responders to streamline emergency services especially in instances involved with persons who have a communication disability. The Community Action Model was the framework utilized for implementation and tracking was conducted through frequent SBAR communication with various team members as well as the community itself. Data analysis was conducted through a

SurveyMonkey survey given to users of the QR code as well as the team members involved with the implementation and evaluation of the project. The project site did not have its own IRB approval process so an official IRB review was conducted to ensure the protection of those involved with the project.

Description of the Methods and Measurement

The Community Action Model uses a 5-step process which uses skill-based training, action research, analysis, policy development, and implementation to eliminate health disparities by addressing social determinants within communities (Hennessey et al., 2005). The primary goals of the Community Action Model are utilizing members within the community to create community-wide change rather than only asking individuals to change and providing assistance in making those changes for those who need it (Hennessey et al., 2005). Community members are often the first to arrive at an emergency scene as innocent bystanders. Involving the community in this project lead to increased awareness of wearable technology within the community itself and allowed for any individual within the community who owns a smartphone to potentially intervene when a person with a communication disability is in crisis. Increased awareness of the availability of this technology may also lead to increased usage of the product within the community itself.

Discussion of the Data Collection Process

Data collection was conducted through a simple questionnaire given to all team members involved and any QR code users. The questionnaire discussed the benefits perceived by first responders and users of the product as well as any weaknesses found following implementation, evaluation, and use. The questionnaire was available via a scannable QR code through

SurveyMonkey which allowed for immediate retrieval of data and ease of completion by team members and users.

Implementation Plan

Implementation began in August 2020. Prior to implementation, development of an educational pamphlet was completed discussing the use of QR codes in emergency settings with a specific focus on the company with which we are partnering. Also included within the pamphlet was a coupon code which allowed for a discounted price for users. The first step of implementation included educating the project partner on the concept of using QR codes to streamline emergency service processes. During this meeting, the educational pamphlet was reviewed and any questions or concerns were addressed. Following the initial project partner meeting, community engagement and promotion of the QR code program began through email and virtual visits to various entities such as Senior Day Camps, Assisted Living facilities, and local schools.

Education offered to the community was similar to the education given to first responders, however the focus was on usage and availability of this technology, especially in those with communication disabilities, rather than how it can be used in an emergency situation. Increasing first responder and community awareness of the presence and availability of wearable QR codes may lead to streamlined emergency service processes when encountering those experiencing communication disabilities. Bi-weekly meetings were conducted with the project partner to discuss any encounters with persons wearing a QR code bracelet, especially those involving persons with a communication disability. If encountered, successes as well as set-backs were discussed and what improvements can be made to further engage the community and first responders.

Timeline

The project implementation tool, tracking tool, and timeline were discussed July 9, 2020. Implementation began at the beginning of the Fall 2020 semester, August 10, 2020. Throughout the semester, bi-weekly meetings were conducted to discuss project successes and set-backs.

Section IV. Results and Findings

Results

I measured education through a post-education survey which was completed by Fire and EMS participants. Through this survey, I measured perceived improvements QR codes may provide when encountering persons with communication disabilities in emergency situations. I also measured QR code sign-ups through EmergencyScan, how often profiles on EmergencyScan were accessed, and how often (if any) Fire/EMS encountered these QR codes while on duty. While no formal measurement was conducted within the community secondary to COVID-19 restrictions, various community members were informally interviewed in order to obtain the community's perspective on the use of QR codes for residents with communication on disabilities. Although persons without disabilities (the various community members) were not my target population, I valued their input secondary to the belief they may have a family member or friend who suffers with a disability which impairs their ability to adequately communicate with others in emergency situations. The community members thoughts and opinions were crucial to project implementation as their participation through usage of the scannable QR as well as spreading awareness of the availability of this technology, was necessary for successful implementation.

Expected Results

I was hopeful of a 50% completion rate on the post-education survey. I expected to get at least 10 community member sign-ups for QR utilization through EmergencyScan. With no formal measurement within the community secondary to COVID-19, my goal was simply that community members voiced their approval and understanding of the project.

Actual Results

Table 1

EmergencyScan Website Visits Data

Dates	Site Visits from North Carolina	Percentage of Total Visits to Site	New Sign-ups
09/01/20 - 09/07/20	No new visits	0.00%	0
09/08/20 - 09/13/20	4	6.00%	4
09/14/20 - 09/20/20	21	32.31%	0
09/21/20 - 10/04/20	7	7.22%	0
10/05/20 - 10/19/20	18	10.00%	0

Note: Site visits from North Carolina equated to 0%, 6%, 32.31%, 7.22%, and 10% of the total visits to the EmergencyScan website during the above stated time frames. This showed no correlation with new sign-ups which used the coupon code for the county as there were 4 new sign-ups from 09/08/2020 – 09/13/2020 but none on the other weeks which showed more website activity from North Carolina.

Six out of the eleven paid personnel at the fire department completed the post-educational survey for a 54.5% completion rate. The same survey was sent out separately to the 57 volunteers who offer their time and services at the fire department. Twenty-three of the 57 volunteers completed the survey for a 40.4% completion rate. The overall completion rate was 42.6% which was slightly under expectation. I had four sign-ups for EmergencyScan using my specified coupon code. No fire/EMS personnel have encountered someone wearing one of these QR codes in the community. Biweekly analysis of profile access was reported by

EmergencyScan. The data which is reported in Table 1, however, includes all profiles within EmergencyScan and was therefore deemed unusable for this project as it was not exclusive to persons who were presented with the information through this project. We were able to discern new site visits which originated from North Carolina, but again this data is not reliable as it is not exclusive to persons who were directly encountered through this project.

Community participation during a pandemic has to be the most difficult part of implementation and the largest deterrent for those who may have benefited from the services EmergencyScan provides. Without community participation, it is difficult to educate the community of this available technology. With further increased community participation, I believe the project could have shown greater success and allowed for more data collection. Virtual educational sessions may have proven to be beneficial; however, with the added stress many members of the community were experiencing secondary to the pandemic, it was difficult to even obtain a response from those I reached out to during this time. Teachers were having their own difficulty with virtual education which limited their time and ability to correspond with me. Various entities within the community, such as the health department, primary care offices, and public service offices, were inundated with pandemic-related complications. I would like to continue this project after the pandemic as I truly believe this technology would show an improvement in emergency care services provided to those with communication disabilities.

Outcomes Data

I gathered data on the number of paid/unpaid fire and EMS workers who completed the educational PowerPoint and the post-education survey. Quantitative and qualitative data was gathered regarding whether or not the fire/EMS personnel believed this to be a feasible project topic and if it would truly benefit the community involved. Partnering with EmergencyScan

allowed me to collect further quantitative data, which can be found in Table 1, in regards to new sign-ups and site visits from North Carolina residents which could be potential consumers of the wearable QR codes. Informal interviews led to qualitative data collection and allowed for a means for project improvement through various community members suggestions on how this project could be more applicable to the community.

Process Measures

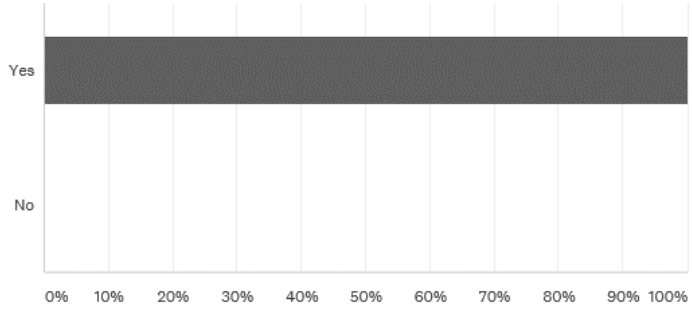
Process measures included the use of PowerPoint, SurveyMonkey, and Vistaprint to create concise educational materials which could be given to both the participating fire/EMS personnel and to the community along with a post-education survey.

PowerPoint was used to create the pre-project education necessary for first responders and the community to appreciate the problem presented and the purpose of the project. A voice-over was recorded within the PowerPoint in order for participants to complete the education within the constraints of their schedule. The PowerPoint included thirteen slides which discussed what a DNP project entails, the target population and purpose of the DNP project, along with the relevance to the local community. The PowerPoint also introduced the first responders to EmergencyScan and their mission.

Once participants completed the PowerPoint with voice-over, they were given the link to a SurveyMonkey post-education survey. The survey included four simple questions evaluating the effectiveness of the survey as well as addressing any possible concerns perceived. Figures 1, 2, and 3 show the results from questions one, two, and three of the post-education survey.

Figure 1

SurveyMonkey Question One Post-Education Survey Results



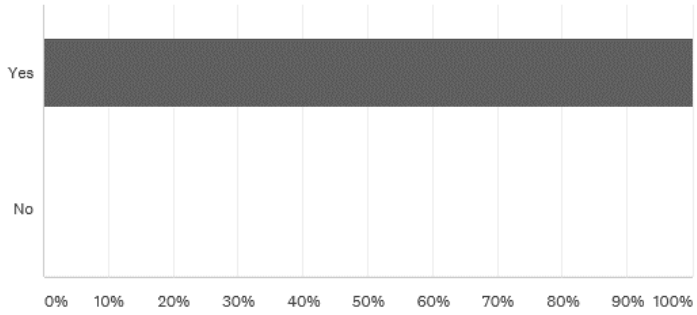
ANSWER CHOICES	RESPONSES	
Yes	100.00%	29
No	0.00%	0
Total Respondents: 29		

Comments (0)

Note. Question one - Do you think this project is a good idea?

Figure 2

SurveyMonkey Question Two Post-Education Survey Results



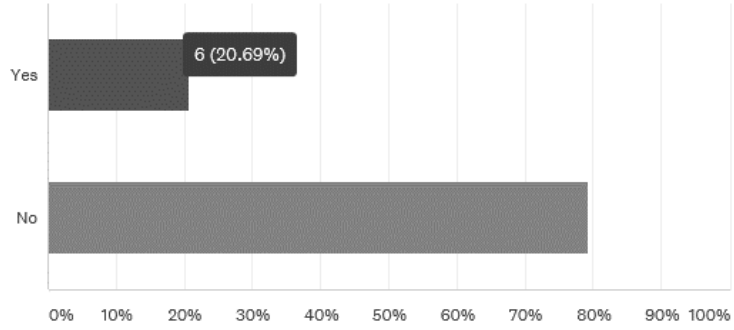
ANSWER CHOICES	RESPONSES	
Yes	100.00%	29
No	0.00%	0
TOTAL		29

Comments (0)

Note. Question two - Do you feel as if the PowerPoint answered any questions you may have about the project?

Figure 3

Survey Monkey Question Three Post-Education Survey Results



ANSWER CHOICES	RESPONSES	
Yes	20.69%	6
No	79.31%	23
TOTAL		29

Comments (0)

Note. Question three - Do you know anyone who would be interested in a service like EmergencyScan?

A pamphlet was developed through Vistaprint which was geared towards educating the community in which the project was taking place. The pamphlet included information on the concern perceived within the community with regards to emergency service processes when encountering persons with communication disabilities and the purpose of the DNP project in addressing this concern. The pamphlet introduced EmergencyScan to the community along with the availability of wearable QR codes which may be used to streamline emergency service processes, especially in the presence of communication barriers.

Outcomes Measures

The gaps between the results I originally expected and the results I actually found were that survey participation did not meet the goal I had originally hoped to reach and I was unable to obtain 10 sign-ups. I continued implementation through the end of 2020 in the hopes that I would

be able obtain my original goal of at least 10 sign-ups. Unfortunately, COVID-19 restrictions continued into 2021 and I was unable to reach my goal. I achieved 40% of the expected sign-ups with four sign-ups using the specialized coupon code for my county. Survey participation was 54.5% by paid personnel and 40.3% by volunteers with an overall participation rate of 42.6%.

Discussion of Major Findings

Major findings through the implementation of this DNP project were that 100% of the Fire/EMS personnel who completed the education and post-education survey believed this technology would improve emergency service processes and the community as a whole, especially in those who experience a communication disability. However, only 29 out of 68 personnel completed the education and post-education survey for a 42.6% completion rate which was slightly under the goal of 50% completion rate. Implementation was hindered by the current COVID-19 pandemic, limiting face-to-face interactions with potential users of the product and those who may encounter it (first responders and the community in general). The community was to be a large contributor to this project, hence the use of the Community Action Model. Secondary to the COVID-19 pandemic, interaction with the public was limited to virtual communication. It was often difficult to receive a response from community members due to a perceived increase in stress, job responsibilities, alterations to normal routines, and the overwhelming presence of the pandemic. Had the COVID-19 pandemic been an issue, I believe further implementation success would be perceived through increased sign-ups and possibly even first responder encounters which included these QR codes.

Section V. Interpretation and Implications

Cost Benefit Analysis

Projected Organizational Cost

The development of the project would be the most time consuming and costly portion of the project. This would require a designated employee who could spend time researching and developing the project to best serve both the fire/EMS staff and the community. Approximately 25-30 hours was required to research the topic and develop the educational PowerPoint and brochures for the community. If the education had been developed by a paid member of the facility, it would have cost approximately $231.75-$278.10 based off the projected hourly wage of firemen in North Carolina which is $15.99/hour. The education provided to the fire/EMS personnel is no to low cost as it can be presented virtually or in-person during scheduled training times. The PowerPoint presentation with voiceover can be viewed in 30 minutes. The post-education survey takes approximately five minutes to complete. With an approximate 35 minutes to complete both the PowerPoint and the post-education survey, the estimated cost per paid personnel would be $9.27 and $102.02 for all eleven paid personnel with a projected total manpower cost (time) of 6.42 hours. Although the expenditure for the site is zero for volunteers, approximately 33.25 hours of manpower cost should be considered with a total of 57 volunteers.

Organizational Benefits from the Project

While the project would not necessarily produce income for the organization, it will provide improved efficiency, reduced workload, and overall quality improvement. Those involved in the project (the fire chief, EMS, and firemen) recognized the benefits QR codes could provide to them and the community as a whole. Efficiency will be improved through a streamlined triage process made possible by the wearable QR codes. The ability to scan the

wearable QR code when the person encountered is unable to communicate with the first responder allows for reduced workload as crucial information is readily available. Scanning the QR code and having readily available information for first responders leads to quality improvement in both the triage process and patient outcomes as care is not limited secondary to lack of crucial information. These three improvements alone, in my opinion, provide much more benefit in comparison to the financial burden. The use of these QR codes could easily be dispersed throughout the state; it is just a matter of educating first responders and the community about their availability.

Unexpected Negatives and Organizational Return on Investment

Unexpected negatives encountered might include a lack of uptake of the technology by the community. Without community involvement and technology consumption, there are no scannable QR codes available to the first responders. I do believe once the pandemic resolves, this project could be quite successful and would not be difficult to continue within the community and other communities/counties within North Carolina.

Resource Management

Resources Available for Success

The majority of the educational process occurred virtually which allowed for efficient dissemination of information to the first responders. Project updates and progress were available via email, allowing all members to be updated in real-time while maintaining social distancing. The local police department has an established program, the “I live alone” program, which has established community members who could benefit from this technology.

Resources Needed but not Available

The inability for in-person presentation of the education session likely led to a decrease in participation by the fire/EMS personnel and did not allow for real-time questions which may have led to a greater understanding of the project.

While the organization has ties within the community, COVID-19 made it difficult to engage with these entities. Virtual education was available with the organization itself but not with the community entities, which made implementation quite difficult.

Feasibility of Re-Allocation of Resources

With the current pandemic, I do not believe that resources could be re-allocated for this project. While the financial cost is minimal to the facility, the manpower cost is significant during a pandemic. The pandemic made all processes more difficult and time-consuming, limiting implementation and educational outreach.

Once the current COVID-19 pandemic resolves, this project could be implemented as originally planned. In-person education and discussion of the project with first responders would resume, allowing for increased participation and uptake of the project. Cost would remain minimal to the facility as the educational portion has already been created and would require little to no revision thereby eliminating costs acquired through this process. Manpower cost, while still substantial secondary to the nature of first responders' work, would have increased flexibility after resolution of the pandemic. Without the current pandemic-related restrictions, community involvement would flourish leading to increased awareness of wearable QR codes and uptake of the technology.

Implications of the Findings

Implications for Patients/Population

Wearable QR codes are cost-effective for consumers and allow for streamlined care administration of emergency services when encountered by first responders or the general public. Through streamlined emergency services processes, the population may experience improved care comes and overall quality improvement, especially those with communication disabilities who are typically unable to communicate their needs in emergency situations. Wearable QR codes worn by those with communication disabilities allow for readily available, crucial information in emergency situations and eliminates a clear disparity experienced by this population.

Implications for Nursing Practice

Streamlined emergency care by first responders whether that includes firemen, EMS, or a member of the general public leads to improved care outcomes for persons with communication disabilities. This streamlined care is made possible by consumption of available technology, wearable QR codes, and is a simple yet effective means to improve patient outcomes. Nurses and those who encounter persons with communication disabilities should be aware of this available technology and educate their patients on its existence and potential benefits.

Impact for Healthcare System(s)

Streamlined emergency service processes through the use of wearable QR codes reduce workload for first responders and provide more efficient means to obtain crucial patient information in those with communication disabilities. This is both cost-effective and time-saving for healthcare systems.

Sustainability

While the organization does believe the project would be a great addition to the community, they are unable to allot the time/money for someone to continue this project at this

time. It would be feasible for them to continue to use my presentation once the pandemic has resolved. COVID-19 has greatly impacted the area in which the organization is located, leading to reduced budgets and time constraints. In the future, the organization may be able to sustain this project if budgeting allows for a designated educator/director of the program.

COVID-19 is the main factor affecting sustainability at this time. Limited in-person communication likely led to decreased community participation secondary to time constraints, social distancing rules, and budgeting issues.

Dissemination Plan

Following Dissemination with the ECU College of Nursing, I plan to participate in virtual presentations with my project partner (Beaufort County Fire/EMS), local church (Bath UMC), and local elementary/middle school (Bath Elementary). Secondary to continued COVID-19 restrictions, virtual presentation is currently the better option. If restrictions are lifted, in-person presentation will ensue. I am in the registration process with the South Atlantic Fire Rescue Expo to obtain a booth where I can have my poster, pamphlets, and products provided by Emergency Scan in the hopes to increase awareness of the presence of wearable QR codes and how they can improve emergency processes. The fire expo attracts Fire/EMS personnel from all over the state and I believe would lead to great exposure to the concept of wearable QR codes and checking for their presence in emergency situations, especially those involving communication disabilities. Table 2 lists the expected dates of dissemination.

Table 2

Whitney Lewis DNP Project Dissemination Plan

Whitney Lewis Project Dissemination Plan		
ECU DNP Project Presentation	4/7/2021	Virtual Presentation
Beaufort County Fire/EMS	5/7/2021	Virtual Presentation
Bath United Methodist Church	5/12/2021	Virtual Presentation
Bath Elementary School	5/14/2021	Virtual Presentation
South Atlantic Fire Rescue Expo (SAFRE 2021)	8/11/2021	Raleigh Convention Center

Note. Using QR codes to streamline emergency service processes project dissemination plan over the next several months.

Section VI. Conclusion

Limitations

Virtual communication secondary to COVID-19 was the biggest limitation in the planning stage. In-person meetings allow for greater dissemination of information and conversations regarding pros/cons of a project. Implementation within the community was also difficult secondary to most communication being virtual secondary to social distancing and visitor restrictions set by organizations. I did not identify any limitations during the evaluation process. COVID-19 may be seen as a barrier however the limitations which were set secondary to COVID-19 led to my difficulties with planning and implementation, rather than the virus itself.

Recommendations for Others

Planning

During the planning stage of the project, it is important to establish a community partner early who is willing to aid you in your project process and is generally interested in the project topic. It would be prudent to reach out to potential project partners prior to the initial planning period to establish relationships and determine the avenue which may lead to the most success. Meeting with the project partner frequently allows for an environment of increased collaboration and overall project success through continuous process improvement and communication. Frequent meetings also help to establish rapport with your site champion, lending to an environment of mutual respect and open communication which may contribute to increased project successes and a means to eliminate “kinks” in the project prior to them actually happening.

Implementation

Weekly or bi-weekly meetings with your site champion are crucial to keep all parties up-to-date on project progress, successes, and failures. Follow-ups with community partners through in-person meetings should occur as often as possible as this allows for greater communication and improved uptake of the project itself. Community resources such as the health department and local school officials should be involved within the implementation process. Community partners may be aware of local events which will reach a large number of people and may be able to offer multiple formats of education to the community such as newspaper advertisements and radio broadcasts. The provision of incentives for participation may lead to improved project uptake and increased project success. Community involvement and dedication of manpower will have a large effect on the project and should therefore be meticulously monitored for uptake and possible improvements.

Evaluation

A post-implementation survey to evaluate the project process, including successes and failures, is crucial to evaluate project success. While the outcomes may not be what was expected it is important to know those who were reached perceived the benefit of the project. Inviting community members to a post-implementation meeting where they can voice their opinions of the project and how it may be further improved to benefit the community would also be prudent. Project success should be determined through project uptake and perceived benefit rather than the sheer number of sign-ups for wearable QR codes.

Recommendations for Further Study

While everyone can benefit from this technology, the target population was difficult to contact, especially amidst a pandemic. Establishing a relationship with organizations who deal with persons with communication disabilities directly would be wise. These organizations may

be able to aid in the development of a means which allows for greater project participation within the community, the target population, and the organizations involved. In-person dissemination, rather than virtual, should be used as often as possible to allow for greater participation and open communication.

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