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**Improving Communication between the Emergency Department and Prehospital
Emergency Medical Services Through the use of a Secure Messaging Application:**

A Quality Improvement Project

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Abstract

Background: Communication between emergency medical services (EMS) and the emergency department (ED) is a key part of treating patients being transported by ambulance. This communication is moving away from traditional radio and cell phone calls to the use of secure text-based apps. These apps can generate metrics and provide real time location information that is not available using traditional methods. Increased use of these apps can improve communication between EMS and receiving EDs.

Local Problem: Wildcat hospital introduced the EMS communication app Twiage in May of 2023. There is low utilization of the app and some EMS and ED staff have resisted using it over already existing methods of communication. The specific aim of this quality improvement project is to increase the use of the communication app, Twiage, to above 60% of EMS transports to Wildcat Hospital by July 14th 2023.

Methods: EMS survey followed by an educational intervention that was made available in the Wildcat Hospital ED.

Interventions: In person education was developed based on survey results. Education was provided in a quick, drop-in format at the Wildcat Hospital ED using a demo version of the Twiage app.

Results: There was no improvement of utilization of the Twiage app use, with 47% of EMS communication to the ED via Twiage pre-intervention and 40% post intervention. There was survey data to suggest the key points of the educational intervention addressed some of the barriers to use of the app.

Conclusions: Intervention was not successful at increasing usage of the app. There was survey data to suggest that education helped overcome some of the barriers to use of the app.

Key Words: *Quality improvement, EMS communication, ED communication, Twiage, secure app, hospital communication app*

Introduction

Communication between prehospital emergency medical services (EMS) and hospital emergency departments (ED) is critically important to manage the care of seriously ill or injured patients. There are two routine forms of communication between EMS and the receiving ED. The first is notification of an incoming patient and is meant to be concise to communicate the potential resources the patient might require on their arrival. The terminology is somewhat inconsistent and can be called an “entry note”, “patch” or “call-in” depending on the specific system. It includes the patient’s age, gender, chief complaint, vital signs, and if any specialty team activations are being requested (i.e. stroke alert, trauma team activation, cardiac catheterization team activation etc.). The second form of communication between EMS and the hospital is to receive orders for care from an emergency department physician. In this case the EMS personnel are requesting special orders and are communicating the patient’s current condition and the physician is dictating orders to them. ED nurses typically receive the prehospital entry note and determine the resources to make available for the incoming patient.

Most communication from EMS personnel in the field uses two-way radio. Cell phones have become prevalent in some areas especially for medical control where faster two-way communication is required. In recent years, there has been the addition of secure phone applications that allow primarily text-based communication between EMS and receiving EDs. These applications have the potential to provide several benefits to communication over radio or phone calls. These benefits include the ability to securely transmit patient demographics, diagnostic data, location data to give accurate arrival estimates, reminder prompts for key pieces

of information, and to generate metrics that can be used for ongoing quality improvement. As these new types of digital communication are new, there is limited study on how their use has changed emergency care.

Problem Description

The Wildcat Hospital ED has recently begun using a secure communication app between EMS and the ED. The current problem is the lack of adoption among some EMS agencies who continue to prefer the traditional methods of radio or phone call to communicate with the ED.

The nature of the problem of EMS agencies not using the new communication app could have a few underlying causes. There could be technical issues, training issues, or conflict with established workflow.

The use of communication apps has the potential to streamline communication and provide more timely and effective care. To study the effects of these apps, they must be used regularly to generate metrics and to adjust their continued use. Therefore, the first step should be to identify why EMS and ED personnel are resistant to using them over the traditional communication methods.

Available Knowledge

The purpose of this literature review is to examine the current state of evidence of communication between EMS and receiving hospitals. It will also suggest how new technology can improve communication to have a positive impact on patient care while increasing efficiency in use of resources, generate easily compleiable metrics for future research, and to identify potential barriers in the use of an EMS communication app.

Databases utilized were Pubmed, Ebscohost, and Google Scholar. The following keywords and phrases were used: “EMS communication application” (app), “EMS to ED communication”, “ED report”, “EMS phone app”, “EMS patient report app”, “prehospital communication technology”, “Twiage EMS”, and “Pulsara”. Results were filtered to include peer reviewed articles from the last 10 years. The search yielded 15 results for additional full text screening. 12 were excluded due to lack of relevance. Three articles were retained for this literature review.

Bladin et al. (2022) used a quasi-experimental pre-posttest design to examine the effect the Pulsara communication system had on time to treatment for patients presenting with acute stroke or ST-elevation myocardial infarction (STEMI). EMS reported to the hospital using their usual methods of radio or phone call in the pre-intervention phase. During the intervention phase, Pulsara was used to send information to the receiving hospital and activate the necessary resources. The authors then compared the times for several key treatment metrics. It was found that there were reductions in time across the board. In patients with suspected strokes, EMS spent an average of 5 minutes less on scene, patient was evaluated an average of 17 minutes faster once in the ED, and they received their CT scan an average of 44 minutes earlier. (Bladin et al., 2022). Metrics for STEMI were similarly improved with the door to successful percutaneous coronary intervention (PCI) time down an average of 17 minutes. The researchers point out that there were no significant changes in mortality or measures of morbidity for these patients.

The researchers also identified some barriers to staff in using the Pulsara system. During the intervention phase, EMS was given the option of using it, but they could still use the baseline radio system if they preferred. Some staff reported difficulty in using the system, including not

knowing the correct login information, seeing the use of the app as a cumbersome additional step, or “falling back” into their usual procedures in a stressful situation and forgetting to use the app. The authors suggested that the use of the app become mandatory to overcome hesitance to its use and to generate more useful data.

Fukaguchi et al. (2022) examined the use of a cell phone based app to streamline communication between EMS and receiving hospitals. Measures for transport time, amount of time spent on a voice call between EMS and the hospital, and patient mortality were tracked for eight weeks prior to and after the introduction of the app. The authors found no significant differences in patient mortality or incidences of adverse outcomes. There was a slight but significant reduction in patient transport times. There was a significant reduction in the amount of time spent on the phone, with the median decreasing by 22%. The authors did not track time metrics for care after the patient arrived at the hospital. They did suggest post arrival metrics provide an additional area of study as staff reported being more informed about the incoming patient’s needs prior to arrival.

“Evaluative Research of Technologies for Prehospital Communication and Coordination: a Systematic Review” (Zhang et al., 2020) examined other research on the integration of new communication technology in emergency care. Of specific interest in this review were factors that caused challenges to integrating new communication technology into EMS and hospital systems. There were 17 articles included in the review. The most common issue encountered when adapting a new communication system were defined as “technical challenges”, where the system failed to function properly. The authors found 14 instances of technical challenges in the reviewed literature. The second was “usability challenges”, with 12 instances found. Usability challenges describe the difficulty in integrating the new communication technology into an

existing workflow making it distracting, time consuming, or inconvenient to use. 10 instances of “organizational challenges” were found, where these are deficiencies in training offered to staff, lack of integration with other teams, and organizational attitudes towards change.

Based on the available research, phone-based communication applications show some promise at improving how EMS and ED systems can deliver care. They can reduce the need for phone or radio-based communication, provide secure methods to transmit information, and can increase the timeliness of care for critically ill patients. Common issues in communications technology have been reviewed to identify and address problems when integrating into an EMS/ED system.

Rationale

Wildcat hospital ED has recently started using a communication app for EMS agencies to give pre-arrival report to nursing staff. There has been poor adoption of the new system with many EMS agencies still preferring to use the existing radio system to give pre-arrival report.

The model for this quality improvement project will be the Plan-Do-Study-Act (PDSA) model. The plan phase has identified the low use of the new communication system as the key area of study. In the “Do” phase baseline data of how often the app is used compared to the radio will be collected. Simultaneously, EMS and ED staff can be surveyed to gain insight as to why they might not prefer to use the app. The “study” phase will look at the available data collected from use and surveys to identify barriers to staff buy-in and utilization of the new system. Once barriers are identified, an intervention can be done in the “act” phase. This cycle can be repeated to identify and address multiple areas of improvement.

Specific Aims**Global Aim**

The global aim of the quality improvement project is to increase EMS use of the communication app for routine per-arrival patient reports.

Specific Aim

The specific aim of the quality improvement project is to have greater than 60% of routine pre-arrival reports by EMS made through the communication app by mid-July.

Methods**Context**

As the communication system is online, there are no additional costs associated with increasing its use. Costs are carried by the hospital and there is no charge incurred by EMS agencies. Therefore, additional costs for this quality improvement project are to be minimal compared to potential benefits.

Interventions

Education was developed with key stakeholders using information from the pre-intervention survey. Education was provided in a drop in format in the Wildcat Hospital ED and designed to be no more than 10 minutes in length. A demo version of the Twiage app was made available for demonstration and to allow EMS providers to complete mock patient reports without impacting normal operations in the ED. Key points covered were basic use of the app, important information to include, and use of the media feature to send images to the hospital.

Study of the Interventions

The main measure tracked was the usage rate of the app expressed as a percentage compared to the total number of EMS transports to Wildcat Hospital ED. This data is available and can be tracked by obtaining the number of reports made in the app compared to the total number of patients brought into the ED via EMS. A post intervention survey was conducted in person after the educational intervention. Information was also shared during weekly check-in meetings with ED managers and IT regarding the ongoing use of the app.

The secondary measure is a survey sent to ED and EMS staff to gauge issues that are impacting buy-in. The survey was designed during the weekly meetings with key stakeholders and EMS managers.

Analysis

The percentage of EMS reports received through the app will be measured as quantitative data expressed as a percentage. The number of times the app was used was compared to the total number of EMS reports received by the ED.

A qualitative, categorical analysis was performed on data gathered by surveys filled out by EMS and ED personnel. The survey was designed to identify the perception of the app among EMS providers, in addition to asking about specific features in the app. The survey was filled out primarily during conversations with EMS providers at the ED as online survey responses were extremely low.

Ethical Considerations

Any patient data included was anonymized and will not include any protected health information. All surveys sent to staff members were voluntary and anonymous. This author is currently an EMS provider with previous experience using the Twiage app but has not been employed by Twiage or any of its competitors.

Results

Initial Steps

The PDSA cycle was used to develop and implement the planned intervention. In the plan phase, baseline data for the usage of the Twiage app was collected. After the app was introduced, a survey was sent to EMS agencies to gauge the response to the app and identify any barriers to use. In person surveys were conducted during regular EMS training meetings and in the ED as EMS arrived with patients. Targeted educational classes were then developed to address any identified barriers to increase utilization of the app.

Quantitative Process Measures and Outcomes

There were two measures involved in the development of this project. The first was the total number of times the app was used expressed as a percentage of the total number of patients transported to Wildcat Hospital via EMS. Figure 1 displays the utilization of the Twiage app for the month of May pre intervention, while figure 2 displays post intervention. In the month of May there were 770 total patients transported to Wildcat Hospital via EMS, 53% of pre arrival reports were received the traditional way and 47% via the Twiage app. In the post educational intervention there were 1,117 total transports with 61% being traditional reports and 39% being via Twiage.

Figure 1
Communication Method of EMS Transports May 1 -May
31

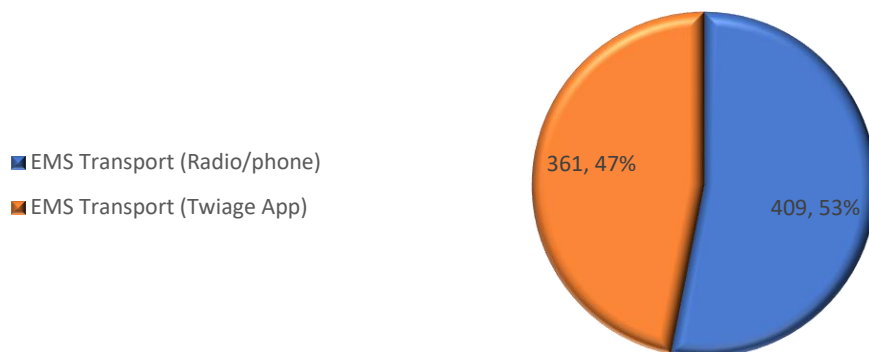
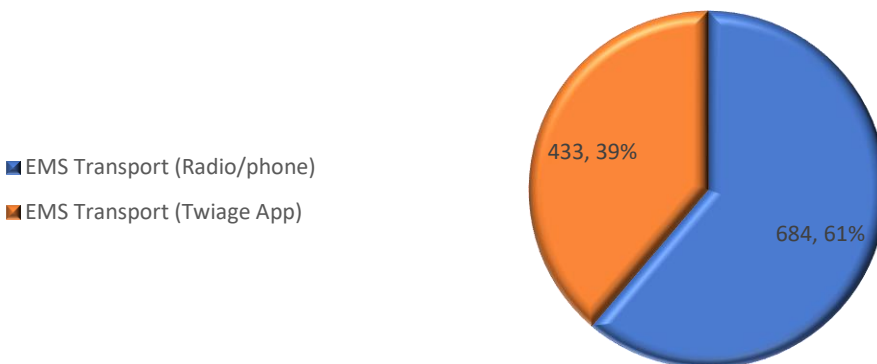


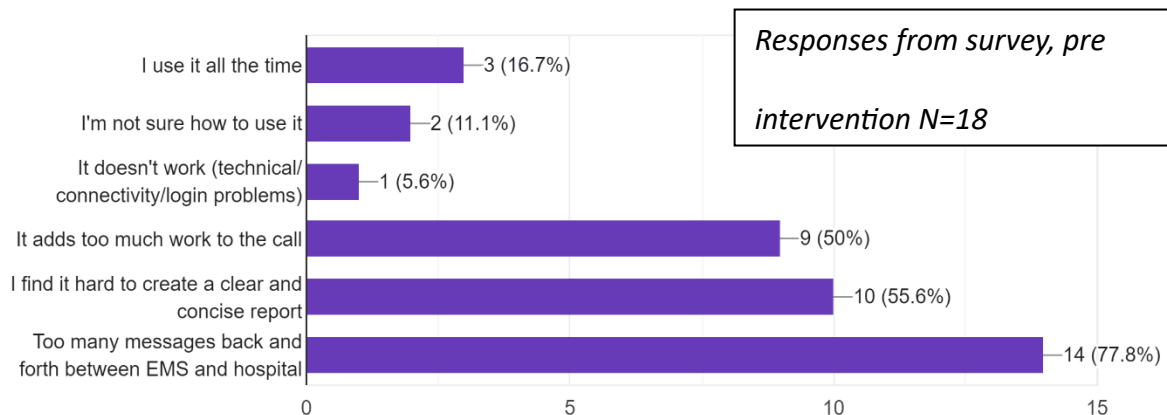
Figure 2
Communication Method of EMS Transports (June 14th-
July 14th, post intervention)



The second data set was a survey that was sent out to EMS agencies that were new to using the Twiage app. Only 10 responses were received online. Eight additional responses were obtained by asking EMS in person with answers being transcribed into the digital survey form on their behalf. Figure 3 shows collated responses for issues EMS experienced in the use of the Twiage app.

If you do not use Twiage, what keeps you from using it? Select all that apply.

18 responses

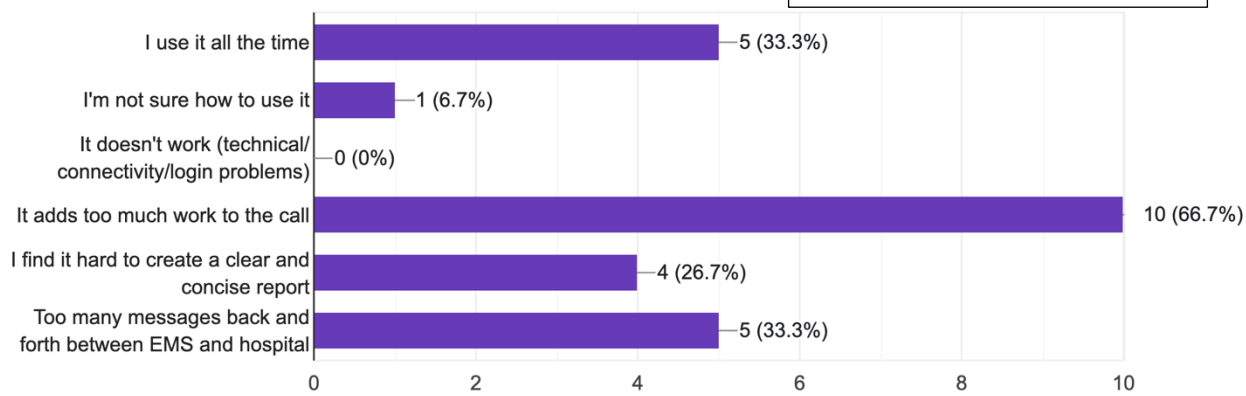


The post intervention survey was only conducted in person due to the low response rate of the online survey. EMS were offered additional refresher training on using the Twiage app and then were asked questions in person. During this phase, 15 responses were documented in the survey. Responses indicated some success in the refresher training. There were five responses by EMS providers stating they “used the app all the time”, compared to three in the pre intervention period. Technical problems were rare in both instances with one pre-intervention, and none reported post-intervention. There was still an impression that the use of the app added unneeded work, ten responses indicated this pre intervention and nine post intervention. The category with the most change was the experience of excessive messages from the hospital, with 14 reporting this on the pre intervention survey and five reporting on the post intervention survey. There was also a reduction in the feeling that reports sent to the hospital were not clear or concise from 10 to four. Figure 4 shows the response data for the post education survey.

If you do not use Twiage, what keeps you from using it? Select all that apply.

15 responses

Figure 4: Post education Survey



The major themes of the survey relate to the changes in workflow using the Twiage app. EMS providers felt its use was inconvenient and more complicated than the traditional method of a report given over the radio. Comments received in an additional free-text field and during in-person training had similar feedback including “It looks unprofessional to be poking at a cell phone while providing care”, “It is too complicated when I can just give a 10-20 second radio report”, and “not enough time to use when there is a short transport time”. When speaking to EMS providers there seemed to be animosity towards the use of the app and low interest in increasing its use. This attitude seemed to be contained to specific EMS agencies, but this data point (place of employment) was not tracked specifically on the survey. Technical problems appeared to be rare, and most EMS providers surveyed stated they had been provided some basic education on its use.

Survey response was low when looked at in comparison to the total number of EMS providers the survey was made available to. However, the themes regarding the use of the Twiage app seemed consistent with observed attitudes even with the small sample size.

Discussion

Summary

Key Findings

The use rates of Twiage fell by 8% in the pre and post intervention periods. There were more changes noted in the pre and post intervention survey. Prior to the educational intervention 55% of surveyed EMS providers felt it was too difficult to create a clear and concise report for the hospital while 77% felt that there were too many text messages involved in the communication. After education was provided, these were reduced to 26% and 33% respectively. There were still EMS providers that felt use of the app to communicate with the hospital interfered with their workflow with this perception increasing from 50% to 66% in the pre to post intervention period.

Relevance to the Rationale

The PDSA cycle was used to identify barriers to the use of the Twiage app. Key stakeholders were identified in the planning phase and consisted of leadership from the ED and local EMS agencies. EMS personnel were surveyed to gain their perceptions on the communication app and begin to identify specific barriers to its use. The survey indicated that there were issues in workflow, resulting in frustration and less than optimal communication between EMS and the hospital. EMS personnel reported that they felt they could not create a coherent report compared to making a call to the ED over the radio or phone. There was also the perception that there were too many distracting messages where ED nurses asked for missing or

additional information, creating a distracting number of messages. Working with key stakeholders, educational interventions were developed to address some of the issues encountered by EMS to increase workflow efficiency, decrease the number of superfluous messages, and emphasizing key pieces of information to be included in a patient report. This education was made in person to EMS providers along with “test” version of the app that could be used to demonstrate best-use practices. In a post survey, some of the issues identified had been addressed but there was no major change in the rates of use of the app.

Relevance to the Specific Aim

The global aim of this quality improvement project was to make use of Twiage the standard method of communication for ESM providers communicating a pre-arrival report to the ED. The specific aim was to have greater than 60% of pre-arrival reports given through Twiage by July 14th. The intervention was not successful in increasing rates of usage as stated in the specific aim, with use plateauing over the course of pre and post intervention phases. There was success in identifying and addressing some of the issues with the use of the app.

Project Strengths

At the time of this quality improvement project, this author had a prior background in EMS and had over a year of using the Twiage app in other EMS-ED systems. This created a unique situation of being familiar with the app and its use and providing education to other EMS personnel. There was strong stakeholder buy-in from leadership of the ED. Wildcat Hospital is also looking to expand the use of Twiage to other campuses, meaning lessons learned while undertaking this QI project have can be applied in those locations.

Interpretations

Impact of the Intervention

There was a fall in the percentage of cases where Twiage was used. There were more cases transmitted via Twiage in the post intervention phase, but this can be attributed to the staggered rollout of the app where more EMS agencies were given access throughout the month of June. There was also a much higher call volume for the end of June through July with 1,117 compared to 770 for the month of May. There was data from the survey that suggested the educational intervention was successful in addressing some of the main concerns of EMS providers. While not tracked on the survey, there appeared to be large differences among differing EMS agencies in their use of Twiage. Some adapted quickly and seemed invested in using the app while others appeared resistant to its use on an organizational level.

Comparison of Results

Zhang et al. (2020) sought to identify and describe common issues when integrating new technology into prehospital communications in “Evaluative Research of Technologies for Prehospital Communication and Coordination: A Systematic Review”. Three main categories of challenges to integrating EMS communication systems in this review were “technical challenges”, “usability challenges”, and “organizational challenges”. Technical issues appeared rare with the use of Twiage at Wildcat ED and did not appear to have a major impact on the rates of EMS utilization. The primary issues identified and addressed by this QI project appear to fall into the category of usability challenges, where familiarization and adjustments to workflow were primary aspects of identified barriers and focus of the educational intervention. Organizational challenges appear to play a role based on discussions with EMS providers. As mentioned above, there were differences between specific EMS agencies in the use of the app. Specific agencies also seemed less receptive to education, declining to participate in the offered demonstration or survey to identify the cause of their apprehension.

Impact on People and Systems

There appeared to be a positive impact in engaging EMS providers in discussions and providing in-person education. EMS providers had been supplied with digital and printed materials on Twiage use but had limited practice in hands-on use outside of using it with real patients. This led to high pressure situations where mistakes led to apprehension in using Twiage rather than seeking out correct information or procedures.

Reasons for Differences Between Observed and Anticipated outcomes

The intervention did not meet the goal of increasing twiage utilization to greater than 60% of patients transported via EMS. There was a staggered roll out of Twiage to area EMS agencies. The number of Twiage cases increased over time but the percentage compared to the total number of transports remained relatively unchanged. The intervention did not specifically target organizational challenges to its use, which appeared to be a barrier in specific EMS agencies. While buy in from ED leadership was high there was inconsistent buy in from the leadership of EMS agencies in the need for additional Twiage training.

Costs and Strategic Trade-offs

The financial costs of the Twiage system are the responsibility of the hospital system and there are no costs for EMS agencies who use it. Therefore, there is no cost barrier to increasing its use once introduced by a hospital. Communication apps like Twiage aim to decrease phone call volume into a busy ED and generate metrics, both of which can increase efficiency of care and reduce costs. In person education was available in a drop-in format after EMS had transferred patient care at the hospital. Surveys were conducted with free online tools and in person.

Limitations

There were some limitations involved in this QI project. Generalization may be difficult where apps other than Twiage are being used to communicate to the hospital. The timeline of this project was also a challenge, key stakeholders were operating on a much larger scale than the scope of this project. This led to delays gathering preliminary data. Time for the educational intervention was limited and did not reach EMS providers that worked night shift. There was also limited buy-in from stakeholders of EMS systems which minimized the scope of the planned educational intervention.

Overcoming cultural and organizational barriers were also a main limitation. EMS providers that did not see the value in using the app over traditional phone conversations were not receptive to the provided education. Some seemed to see Twiage as inefficient and voiced that they saw no reason to change their current procedure when communicating with the hospital, and thus felt there was no reason to participate in this project. When the survey was designed EMS providers were not separated into categories to track which agency they worked for. Doing so could have provided valuable information on the rates of usage amongst different agencies and led to additional targeted intervention strategies.

Conclusions

This quality improvement project failed to increase the use of the Twiage app to desired levels. The intervention to provide education to EMS providers on the use of the app did yield some survey data that suggested a positive impact. The intervention is easy to replicate and communicate to other hospital systems as they adopt the Twiage app. The key obstacles into increasing use in this case appeared to be organizational, as specific EMS agencies resisted its use much more than others.

An extension of this project could be to create Twiage “super users” that are knowledgeable about the app. These users can include both EMS and ED staff and serve as an educational resource for new users. Having this resource would also make education on the app more available and encourage sustained use of the app.

References

- Bladin, C. F., Bagot, K. L., Vu, M., Kim, J., Bernard, S., Smith, K., Hocking, G., Coupland, T., Pearce, D., Badcock, D., Budge, M., Nadurata, V., Pearce, W., Hall, H., Kelly, B., Spencer, A., Chapman, P., Oqueli, E., Sahathevan, R., ... Cadilhac, D. A. (2022). Real-world, feasibility study to investigate the use of a multidisciplinary app (Pulsara) to improve prehospital communication and timelines for acute stroke/STEMI care. *BMJ Open*, *12*(7), e052332. <https://doi.org/10.1136/bmjopen-2021-052332>
- Fukaguchi, K., Goto, T., Yamamoto, T., & Yamagami, H. (2022). Experimental Implementation of NSER Mobile App for Efficient Real-Time Sharing of Prehospital Patient Information With Emergency Departments: Interrupted Time-Series Analysis. *JMIR Formative Research*, *6*(7), e37301. <https://doi.org/10.2196/37301>
- Zhang, Z., Brazil, J., Ozkaynak, M., & Desanto, K. (2020). Evaluative Research of Technologies for Prehospital Communication and Coordination: A Systematic Review. *Journal of Medical Systems*, *44*(5), 100. <https://doi.org/10.1007/s10916-020-01556-z>